TERRA

THE NATURAL HISTORY
MUSEUM OF
LOS ANGELES COUNTY

VOLUME 28, NO. 1
FALL 1989

Norwalk's Paddison Farm is like a window looking back onto Los Angeles's more bucolic past. At center is Norwalk's first commercial gasoline pump, located at the farm. See Tom Sitton's article on page 41 for more information.

TERRA

THE MEMBERS' MAGAZINE
OF THE
NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY

VOLUME 28, NO. 1
SEPTEMBER/OCTOBER/
NOVEMBER 1989

COVER: An American Kestrel perches atop a turret at the east entrance to the Natural History Museum of Los Angeles County. This small falcon is one of more than one hundred native bird species recorded from Exposition Park and is one of the few birds of prey that has made the adjustment to urbanization of habitats. See "The Urban Cowbird" by Kimball L. Garrett on p. 10. Painting by Jonathan Alderfer.

DIRECTOR
Craig C. Black

CHIEF DEPUTY DIRECTOR
Mark A. Rodriguez

LOS ANGELES COUNTY BOARD OF SUPERVISORS
Deane Dana, Chairman, Fourth District
Peter F. Schabarum, First District
Kenneth Hahn, Second District
Edmund D. Edelman, Third District
Michael D. Antonovich, Fifth District

HEAD OF PUBLICATIONS
Robin A. Simpson

EDITOR
Kathy Talley-Jones

ASSOCIATE EDITOR
Harry J. Pack

EDITORIAL BOARD
Craig C. Black / Daniel M. Cohen / Janet R. Fireman / Joan Grasty / John M. Harris / Peter C. Keller / William A. Mingst / Harry J. Pack / Robin A. Simpson / Kathy Talley-Jones

DESIGN
Armin Krumbach

MUSEUM PHOTOGRAPHERS
Dick Meier / John De Leon / Don Meyer

ADVERTISING SALES REPRESENTATIVE
Western Media Sales
50 West Hillcrest Drive, Suite 215
Thousand Oaks, CA 91360
Telephone: 805 / 496-3500
Telex: 182640 WKVG

TERRA is published by the Natural History Museum of Los Angeles County and is sent as a benefit to museum members. Single copy price: $4. Subscriptions: $14 per year. For membership information, visit the Membership Office at the Natural History Museum or call 213/744-3426. All other inquiries can be referred to the Publications Office, Natural History Museum, 900 Exposition Boulevard, Los Angeles, CA 90007. Printed by North Hollywood Printing Co., Inc. Color separations by Goody Color Separations. Typography by Graphic Specialists.
All Rights Reserved. Reproduction in whole or in part without permission is prohibited.
ISSN 0040-3733
© 1989 Natural History Museum Foundation

CONTENTS

NATURAL HISTORY
Library
ANGELES COUNTY
OCT 1 1 1989

Museum on the Move 4

From the Director:
Advancing Environmental and Cultural Education 6

The Urban Cowbird:
The Citified Birds of Exposition Park
by Kimball L. Garrett 10

Carthage: A Mosaic of Ancient Tunisia
by David Soren 17

Night Lizards: The Evolution of Habitat Specialists
by Robert L. Bezy 29

Poison Oak: More than Just Scratching the Surface
by Wayne P. Armstrong 35

The Paddison Farm: A Rural Oasis in Sprawling Suburbia
by Tom Sitton 41

Book Reviews 48

Housecalls 50

Focus on the West 50

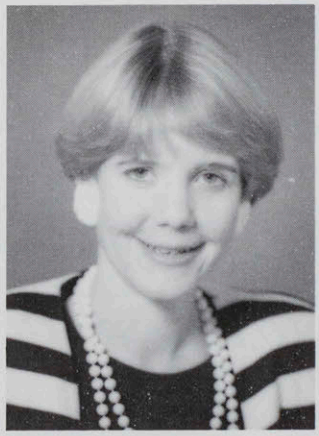
MUSEUM ON THE MOVE

Board of Trustees of the Natural History Museum Foundation
Robert S. Attiyeh
Chairman
Stephen R. Onderdonk
President
Otis Chandler
Vice President
David Comsky*
Vice President
Leslie C. Curtis
Vice President
William A. Mingst
Vice President
Charles O. Parker II
Vice President
Mrs. Thomas Reddin
Vice President
Richard C. Seaver
Treasurer
Dr. M. Norvel Young
Secretary
Richard Call, M.D.*
Assistant Secretary
Ed N. Harrison*
President, Board of Governors
Robert V. Adams
Mrs. Jane Boeckmann*
Franklin Otis Booth, Jr.*
Mrs. Raouf Boudjâkdji
Judge Wm. Matthew Byrne, Jr.**
George V. Caldwell**
Edward M. Carson
James H. Cheney
H. Frederick Christie
Camron Cooper
Mrs. Arthur L. Crowe
Mrs. Justin Dart**
Matthew K. Fong*
Albert B. Glickman**
James C. Hankla*
John F. Harrigan
Alex W. Hart**
Dr. Patricia House
Ivan J. Houston*
Ray R. Irani
Mrs. Betty O. Irvin*
Mrs. Kenneth Leventhal
Jose I. Lozano*
William M. Marcussen*
Dan L. McGurk
G. Everett Miller**
George C. Page
Robert E. Petersen
Sheldon Richman
Richard J. Riordan
Nelson C. Rising
Joseph Ryan
Marc A. Seidner*
Mynatt Smith*
Mrs. James Stewart
Mae Sue Talley**
Richard S. Volpert*
Frank G. Wells
John G. Wigmore*
Gin D. Wong
William R. Zimmerman

*Governor
**Emeritus

Alliance Board of Directors
Mrs. Kenneth Leventhal,
President
Mrs. Thomas Reddin,
Immediate Past President
Robert S. Attiyeh
Walter S. Berkman
William J. Bird
Neal H. Brockmeyer
Mrs. Francis L. Dale
J. Shelton Ellis, Jr.
Mrs. Robert Feinerman
Justice Ronald M. George
Robert Graham
Patricia Herbert
Mrs. Barbara J. Hogue
Dr. Patricia House
Marshall I. Kass
Mrs. Lindbergh Kawahara
Dr. Len Kleinman
Carole Sumner Krechman
Dr. Frank Lavac
Ernest M. Lever
Marvin H. Lewis
Mrs. Hugh H. Logan
Alan G. Lowy
Douglas J. MacDonald
Mrs. Maurice Machris
Ray T. McCullough
John L. Meek
William A. Mingst
Dr. Elliot Mininberg
Mrs. Roy Nutt
Stephen R. Onderdonk
A. F. Osterloh III
Robert Patterson
Mrs. Dan Pocapalia
Sheldon Richman
Mrs. Charles Rinsch
Mrs. Leon I. Singer
Mary R. Spring
Mrs. Irving Stone
Harry H. Tytle
Lorraine P. Young

DEVELOPMENT NEWS



Dick Meier

MEET NANCY NICHOLS, THE MUSEUM'S NEW VICE PRESIDENT FOR MUSEUM ADVANCEMENT. Dr. Craig C. Black, Director of the Natural History Museum, is pleased to announce that Nancy Nichols has joined the museum as its new Vice President for Museum Advancement. Prior to accepting the position with the museum she was Assistant Vice President for Development at California State University, Long Beach. Ms. Nichols has over eleven years of experience in the development and public relations fields. She was for seven years a fund-raising consultant and fund-raising campaign director/manager for the national fund-raising firm of Marts & Lundy.

Ms. Nichols received her B.A. degree in Anthropology from the University of Colorado in Boulder and participated in several archaeological expeditions while at the university, including digs at Mesa Verde, Colorado, and in Colombia. She also has a Master's degree in Information Science from the University of Southern California. Ms. Nichols was an Assistant Professor at Sangamon State University in Springfield, Illinois, for seven years prior to joining Marts & Lundy.

While a consultant and campaign director for Marts & Lundy, Ms. Nichols worked on the organization and successful completion of numerous campaigns for many universities and cultural organizations with fund-raising goals ranging from $2 million to $350 million. Some of the campaigns she has worked on in the past include the University of Utah campaign; University of California, Berkeley campaign; and the U.S. Ski Team campaign. She was also a consultant to UCLA, the University of Alberta Hospitals, and numerous other organizations during her tenure with Marts & Lundy.

THE KRESGE FOUNDATION OFFERS A CAPITAL CAMPAIGN CHALLENGE. The Kresge Foundation has honored the Natural History Museum's 75th Anniversary Capital Campaign with a challenge grant of $750,000 to complete funding for the Ralph W. Schreiber Hall of Birds and the Times Mirror Hall of Native American Cultures (for more information about the Capital Campaign, please see "From the Director" on page 6). By January 1, 1990, the museum must obtain commitments for nearly $2.2 million to receive this important gift.

The museum gratefully acknowledges the following new gifts of the Capital Campaign; these gifts will help us meet the Kresge Challenge:
Mr. and Mrs. Charles G. Bakaly, Jr.*
Dr. and Mrs. Peter S. Bing
Mr. and Mrs. Neal Brockmeyer
Mr. and Mrs. James H. Cheney
Mr. and Mrs. Dudley J. Cook
Honorable and Mrs. Francis Dale
Paquita L. Machris
M.M. and Owens Miller*
Mr. and Mrs. Thomas W. Overton**
Security Pacific National Bank

**in memory of Evelle J. Younger*
***in memory of Cecil Tullis*

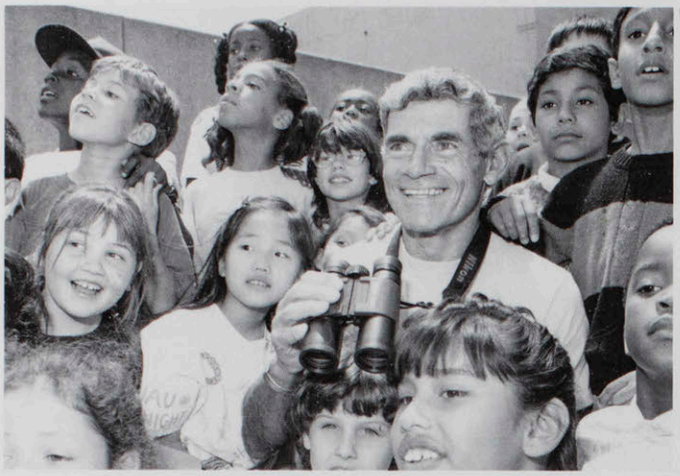
THE MUSEUM REMEMBERS EVELLE J. YOUNGER. The museum's Board of Governors and Trustees will miss the advice and counsel of Evelle J. Younger, a good friend of the Natural History Museum who served as a Governor from July 22, 1986, until his death in May 1989. The museum has received a number of gifts in his honor that will help to complete the Times Mirror Hall of Native American Cultures. For more information on making a donation in Mr. Younger's memory, please contact the Development Office at 213/744-3307.

FELLOWS UPDATE. The museum welcomes the following new Fellows, who will enjoy a new year of adventures in collecting, nature, and discovery with the museum's most active support group. For more information on the Fellows program, please contact the Development Office at 213/744-3307.

Mr. and Mrs. Anthony Clougherty
Mr. and Mrs. Michael L. Dever
Mr. and Mrs. Jack Drown
Mr. Geoffrey T. Dunbar
Mr. Richard C. Fei
Mr. and Mrs. Daniel E. Foley
Charles and Ruth Franklin
Alex and Nancy Furlotti
Lawrence and Marian Janss
Mr. and Mrs. Kenneth R. Kilroy
Frances and Emmett Lynch
Dr. Rochelle Medici
Dr. and Mrs. Mohan Nair
Ms. Deborah Nickson
Merlin and Susan Olsen
Mr. and Mrs. Davis T. Pillsbury
Jane and Don Pinkerton
Dr. Adel F. Samaan
Cynthia Schneider and John O'Brien
Mr. and Mrs. Fred Schoellkopf
Dr. and Mrs. Tim K. Siu
Kristin & Jeffrey Solomon
Nancy & Jim Welsh

BUSINESS ASSOCIATE UPDATE. Ray Wilson & Co. and Merrill Lynch have joined the distinguished group of corporate sponsors who help to sustain the museum's programs.

BIRD QUEST '89. Dr. James Clements continues his worldwide journey to break the record for bird species seen in one



Dick Meier

Dr. James Clements and a group of third graders from the 32nd Street School hunt for a sight of Sesame Street's *Big Bird (*Megagallus humongous*—"humongous giant chicken").*

year; this sojourn will help complete funding for the Ralph W. Schreiber Hall of Birds. Many friends, birders, and supporters of the new hall have pledged gifts from a penny to a dollar per species sighted to support the museum's exciting new environmental exhibit. To date $51,760 has been pledged —$12.94 per bird when Dr. Clements reaches his goal of 4,000 species!

Since January Dr. Clements has spotted birds in India, Cameroon, Ecuador, Venezuela, China, Mexico, Texas, Malibu, Newport Back Bay, and Miami, and his count as of June 3 stood at 1,960 species.

Saturday, June 3, supporters of Bird Quest '89 gathered in the museum's Rotunda to hear Dr. Clements relate his experiences of the previous five months of global birding. For background music he brought a recording he made of bird songs and calls for the Cornell University Library of Natural Sounds. This Mid-Point Party inaugurated a special display in the museum's Foyer charting his progress and listing Bird Quest donors. The museum thanks the following new contributors who have pledged their support to the Ralph W. Schreiber Hall of Birds. For more information on becoming a part of Bird Quest '89, please call the Development Office at 213/744-3307.

■Terence Allan■ JoAnn Lynn Balzer ■ Ebbe and Sandra Banstorp■ Richard Bertoli■ Jean Brandt■ Andrew J. Briggs■ N. Bruce Broadbooks■ Thelma Bulmer■ Ann Cantrell■ Charles Carpy■ Mr. and Mrs. C. S. Chard■ Cheerable Foundation■ Robert Clements■ Roger Converse■ Grace Dance■ C. D. Dickinson■ J. Feynman and S. Hirshberg■ Alec Forbes-Watson■ Mrs. Richard N. Frank■ Don Galli■ James Griffin, M.D.■ Ewel Grossberg■ Dr. Joseph Hearn■ N. Israsena and E. W. Pease■ Robert M. Johnson■ Lauma Jurkevics■ Barbara K. Kasch■ Danielle Krigel■ Bernard Levin■ Emanuel Levine■ Thomas Loe, D.D.S.■ Barbara McHugh-Ward■ Susan Nakamura■ John O'Connell■ Marietta E. Orchard■ Bruce Perlman■ George Rice & Sons/SF■ K. Rose■ Mr. and Mrs. Aldo Rossi■ Ralph Sanders■ Mrs. B. D. Sweetland■ Blinky Talley-Jones■ Mary Thompson and Tom Frillman■ Mary Trischuk■ Clarice Watson■ Drs. Les and Norma Watson■ Dr. Jean Wilson■ David Yanuda

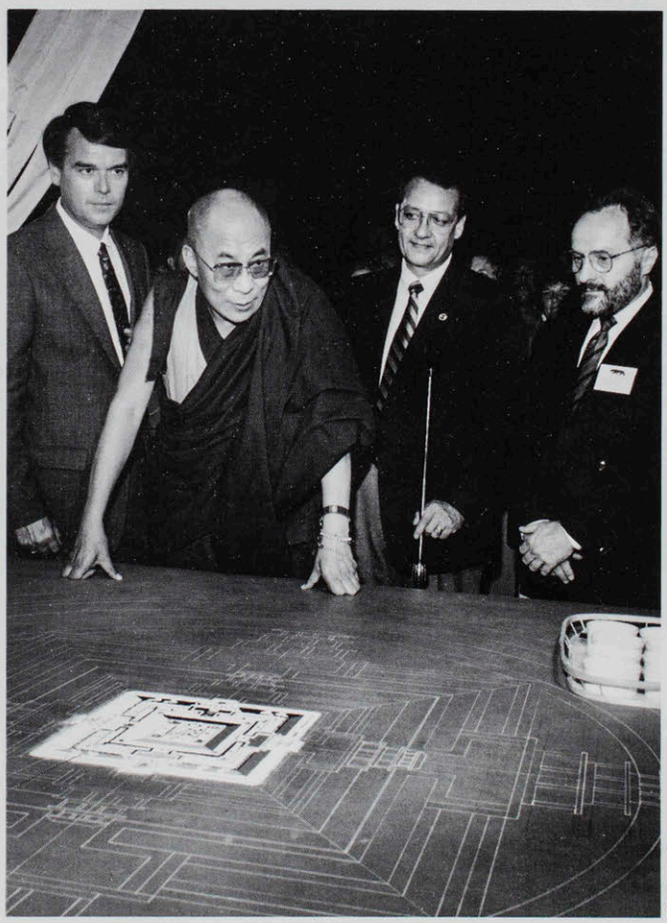
DINOSAUR BALL '89: SALUTING CHILDREN AND FAMILIES. The museum's Alliance Board of Directors proudly reported that funds from the 1989 Dinosaur Ball totaled $389,000, a new high! Special thanks to the Discovery Sponsors: May Company California, ARCO, Mr. and Mrs. Roy Nutt, Mr. and Mrs. Dan Pocapalia, and Mr. George C. Page.

Congratulations to Mrs. Kenneth Leventhal and the members of the 1989 Dinosaur Ball Committee for a very successful event.

RESTRICTED GIFTS. The museum is pleased to acknowledge contributions to further the scientific research and outreach of the museums' distinguished curatorial staff and to strengthen our exhibition and education programs.

Education: Foundations of the Milken Family, L. K. Whittier Foundation
History: Donald W. McNamee in memory of Burton Reiner
Ornithology: Bruce Blackman, Paquita L. Machris
Malacology: Cross Pacific Enterprises Limited
George C. Page Museum: Dr. and Mrs. Earle E. Crandall
African Mammal Hall: Thornton N. Snider
Exhibitions: Bruce McNall, to **The First Egyptians**

THE BIRD COUNCIL. The Bird Council recently spent a day making some of the thousands of leaves needed for the tropical rainforest habitat in the Ralph W. Schreiber Hall of Birds. The council also enjoyed a raptor banding expedition to a rarely seen part of southern California: Rancho Mission Viejo, adjacent to the Audubon Starr Ranch Sanctuary. In addition, the council received a private tour of the egg collection at the Western Foundation of Vertebrate Zoology, a new part of the museum. Funds donated by Bird Council members help the Ornithology Section obtain new specimens for exhibition and for the scientific collection. For more information about the Bird Council, please call 213/744-3366.



Dick Meier

His Holiness the Dalai Lama views the commencement of the Kalachakra sand mandala in the museum's North American Mammal Hall on July 9. With His Holiness are Dr. Peter C. Keller, the museum's Associate Director for Public Programming; Mark Rodriguez, the museum's Chief Deputy Director; and Barry Bryant, of the Samaya Foundation.

Continued on page 46

FROM THE DIRECTOR

It seems appropriate to use this issue of TERRA with its handsome new format to bring you important news about the exciting future of your Natural History Museum. I want to update you on the progress of our campaign to add and improve permanent exhibits, advise you of a prestigious challenge award we have received to complete this effort, and ask for your help.

THE CAPITAL CAMPAIGN

As members of the Natural History Museum you are undoubtedly aware that we are the third largest museum of our kind in the nation and the largest in the west. As we approached our seventy-fifth year of service to the community, we undertook an ambitious $24 million initiative toward expanding and upgrading public exhibition areas for our 1.4 million annual visitors—among them 500,000 school children from throughout southern California.

The first phase of the 75th Anniversary Capital Campaign is nearly complete: more than $21 million has been raised to date. We have opened the popular Ralph M. Parsons Discovery Center and the Chaparral Hall. The African Mammal Hall is undergoing a renovation that will make the habitat groups more accessible and engaging to our visitors. Construction of parking facilities at the George C. Page Museum will soon begin.

Two New Exhibit Halls

Funding for two major projects remains to be completed. The Ralph W. Schreiber Hall of Birds, a 10,000-square foot interactive environmental exhibit, is under construction and is due to open in June 1990. To provide a fitting showcase for our seldom-seen collections of Native American artifacts, we recently held ground-breaking ceremonies for the two-story Times Mirror Hall of Native American Cultures. The important messages they bring will greatly enhance our ability to provide environmental and cultural educational programming for our members and visitors.

MEETING THE KRESGE CHALLENGE

Approximately $3 million is needed to make our new halls a reality. The Michigan-based Kresge Foundation has honored the Natural History Museum by awarding a challenge grant to complete Phase I of the 75th Anniversary Capital Campaign. Simply stated, Kresge will provide the final $750,000 for construction of the Ralph W. Schreiber Hall of Birds and the Times Mirror Hall of Native American Cultures, provided that we obtain commitments for the balance of the $2.3 million by January 1, 1990.

Membership Giving Is Enhanced By Capital Campaign Support

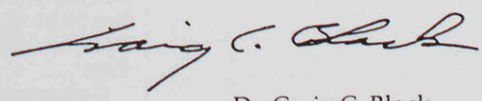
When you join the museum or renew your membership, you are making a significant gift to the museum's Annual Fund, which provides the underpinnings for the exhibitions and educational programs you enjoy at the museum—especially at a time when government support is being curtailed. Your membership contribution is critical to the museum because it funds our basic day-to-day operations and can be used where the museum's needs are the greatest.

Capital campaign giving, in contrast, serves the very important purpose of providing funding for the museum's major building programs. Your annual membership contributions do not support the museum's Capital Campaign or help meet the $750,000 Kresge Challenge. The campaign is a special program that requires significant gifts in addition to those being made on an annual basis. We hope that as a friend of the museum you will continue your critical annual contributions, which play such an important role in supporting our programs, and that you will also want to make a special gift to help us meet the Kresge Challenge and complete the Ralph W. Schreiber Hall of Birds and the Times Mirror Hall of Native American Cultures.

You Can Help

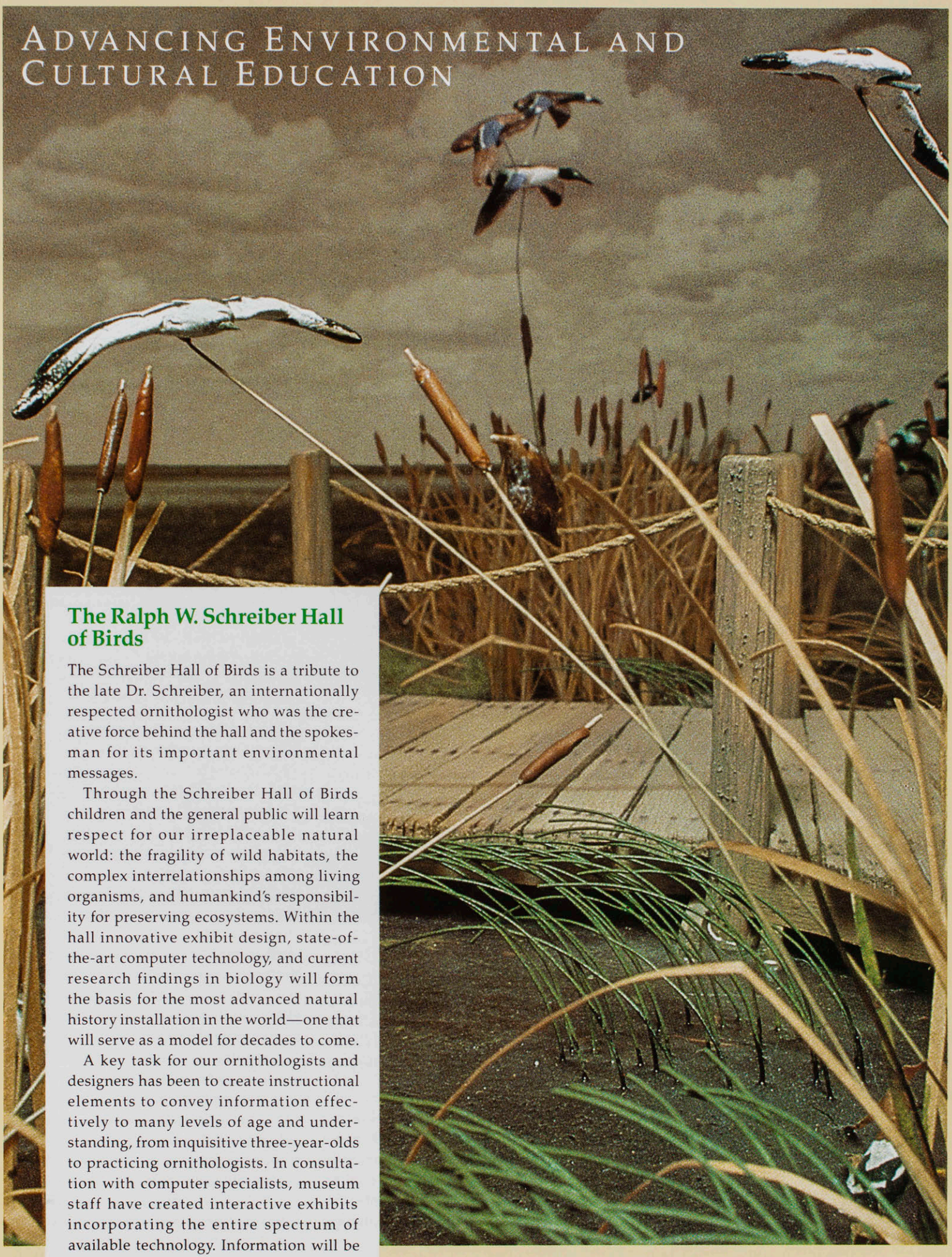
As a member of the Natural History Museum you helped us become eligible for a Kresge grant because you represent our broad-based community support. Now you can help us collect that $750,000—**this fall we will be contacting you to request a special one-time campaign gift in addition to your membership to meet the Kresge challenge.**

I urge you to respond generously so that we may grow with Los Angeles, fulfilling our responsibility to educate and interpret our natural world and rich cultural history. With your help we will approach our centennial as the premier institution this vital region deserves.



Dr. Craig C. Black
Director

Advancing Environmental and Cultural Education



The Ralph W. Schreiber Hall of Birds

The Schreiber Hall of Birds is a tribute to the late Dr. Schreiber, an internationally respected ornithologist who was the creative force behind the hall and the spokesman for its important environmental messages.

Through the Schreiber Hall of Birds children and the general public will learn respect for our irreplaceable natural world: the fragility of wild habitats, the complex interrelationships among living organisms, and humankind's responsibility for preserving ecosystems. Within the hall innovative exhibit design, state-of-the-art computer technology, and current research findings in biology will form the basis for the most advanced natural history installation in the world—one that will serve as a model for decades to come.

A key task for our ornithologists and designers has been to create instructional elements to convey information effectively to many levels of age and understanding, from inquisitive three-year-olds to practicing ornithologists. In consultation with computer specialists, museum staff have created interactive exhibits incorporating the entire spectrum of available technology. Information will be

presented through sound, sight, and touch as well as text to ensure that audiences at every level of education and experience will master the important messages of the hall. Visitors will be encouraged to manipulate mechanical devices, research topics through an interactive videodisc program, and explore three walk-through, computer-controlled habitats, where animation, sound, and light will be allied to create the illusion of living natural environments. Film presentations show bird behavior and the beauty of flight. Visually dramatic displays illustrate such topics as bird anatomy, aerodynamics, and the continuing mystery of bird navigation. Together these exhibits demonstrate the adaptations that birds have made to their environments and the astonishing variety and beauty of bird life that has resulted.

Reaching Public and Scientific Audiences

Each year the museum welcomes over 1.4 million people. The estimated 500,000 children who visit the museum annually will be introduced to absorbing and accurate information about biology in a setting that will challenge their imaginations. Since the hall will stress ecology and the importance of conservation, children will be educated about the world around them, particularly the southern California region. The community served by the Natural History Museum offers an extraordinary educational challenge. Los Angeles, Orange, San Bernardino, San Diego, and Ventura counties are home to 2.5 million school children representing diverse ethnic and national groups. Both public and private institutions in these areas urgently need modern facilities to augment limited school resources and enable individual teachers to supplement their own training by calling on the expertise of museum curators.

This vast potential audience is one principal reason why the Natural History Museum has made construction of the Schreiber Hall of Birds a priority in its Capital Campaign. Another is the distinction of the museum's bird collection, one of the largest and most comprehensive in the world. Because more professional ornithologists live and teach in Southern California than any other place in the world, the hall will become an essential resource for scientists, teachers, and students at every level and in a variety of curricula.

In the Schreiber Hall of Birds children and adults, birders and sportsmen, ornithologists and the general public—all those who love nature and hope to preserve it for future generations—will have access to the information and insight stored in the important life science collections of the third largest natural history museum in the United States.

The Times Mirror Hall of Native American Cultures

The Times Mirror Hall of Native American Cultures, based entirely upon the resources of the museum's extensive ethnological collections, focuses on American Indian cultural traditions from the prehistoric past to the present. The exhibit concentrates on the last two centuries, during which Native Americans have adapted to difficult and constantly changing circumstances. The story the hall tells is not one of isolated cultures frozen in time; rather, the hall deals with the interaction between indigenous and European cultures and the changes constantly wrought in American Indian lifeways. The Times Mirror Hall emphasizes the strength and resilience of Native American traditions and depicts them as continuing, open to the incorporation of outside influences, and contributing to other traditions.

The exhibit chronicles the Native American experience in two different ways: on the main floor of the hall cultural and regional traditions are presented separately so that different peoples' distinct historical experiences may be compared. The hall's mezzanine is devoted to changes in Native American arts from prehistoric times to the present. Uniting the two levels is a two-story reconstruction of a Pueblo cliff dwelling.

The main hall is based entirely on the museum's permanent collections—such as the William Randolph Hearst Collection of Navajo textiles and rare southern California Indian artifacts from the Prudhomme, Coronel, and Del Valle collections. What follows is a brief walk through the exhibit:

☐ The hall opens with a somber telling of the story of the original inhabitants of Los Angeles. A dramatically lit case shows a small, plain chia-gathering basket; because it is the only known example of its kind remaining today, it is a poignant reminder of a vanished way of life.

☐ Striking photographs depict urban Native Americans in Los Angeles. These images provide the context for an audiovisual presentation in which Native Americans describe their lives today.

☐ A contemporary map of the United States and Canada shows the lands still held by Indians. Flanking it is the *Heritage Wall*, which presents an exuberant assemblage of pieces from a wide range of Indian cultural traditions: a painted buffalo robe, intricately woven baskets, a Navajo child's wearing blanket, an Eskimo kayak, and vividly beaded clothing.

☐ An idyllic riverbank scene in Pomo country is the centerpiece of *First Californians;* a full set of everyday Pomo baskets shows the stages of acorn processing from harvesting to boiling acorn mush in a tightly woven basket.

☐ The daily lives of Southwestern people unfold near the two-story Pueblo cliff dwelling: a loom stands surrounded by rare textiles, juniper smoke wafts from a bread oven. The Zuni waffle garden demonstrates the way in which Pueblo agricultural techniques nurture plants while conserving water, a precious resource.

☐ Two parallel exhibits tell of change from the Plains Indians' mobile life hunting buffalo to reservation life from men's and women's separate points of view.

Two themes—tradition and change—pervade the mezzanine exhibition area, which provides a fresh perspective on both traditional and modern Native American art. Visitors arriving on the mezzanine see an "Indian corner," a section of an early twentieth-century house that shows a private collector's assemblage of Indian artifacts. This display leads visitors to consider the influence of collectors—individual and institutional—in defining our notions of Native American artistic traditions.

Art in Prehistory and Art in Transition provides a study in the forces of continuity and change; the focus is four life-size mannequins dressed in the contemporary regalia of Zuni Olla Maidens. They parade with elegantly decorated water jars balanced on their heads and are silhouetted against the Pueblo cliff dwelling. The exhibition concludes with the *Changing Gallery of Contemporary Native American Arts*, which will display a broad range of contemporary, traditional, and studio arts.

Engaging the Imagination of the Southern California Community

Each year more than 1.4 million people will enjoy the Times Mirror Hall of Native American Cultures for its beauty, spirit, and comprehensive and accurate picture of American Indian life. Among them will be 500,000 children on organized tours. Students investigating our state's history will learn how its original inhabitants made use of its resources and lived in harmony with the land and one another.

For the large audiences who attend our annual American Indian Festival and our many education programs and exhibitions exploring Native American cultures, the hall will provide a deeper perspective on these peoples and their experiences. Other audiences will benefit as well. Collectors will come away with a new understanding of the historical, social, and cultural contexts that give these objects meaning for their creators. Los Angeles has the highest concentration of Native Americans in an urban area—the museum's new Times Mirror Hall of Native American Cultures will serve as a historical resource and an affirmation of their cultural identities.

THE URBAN COWBIRD

The Citified Birds of Exposition Park

by KIMBALL L. GARRETT

It might have seemed surreal to the passerby whose vague notions of birdwatching involved the quiet strides of elderly, khaki-clad gentlemen and ladies in tennis shoes stealthily progressing through a thicket rich in colorful birds and alive with birdsong. Here, in downtown Los Angeles' Exposition Park, a block off the bustling Harbor Freeway, were fifteen birders logging thirty-five different bird species on a crisp early November morning—without the benefits of a patch of native habitat or isolation from the noise and frantic pace of the nation's second largest city. This occasion was the Second Annual Dick Davenport Memorial Bird Walk. The event has proved, in its infancy, to be less a commemoration of the comic-strip life of the ornithologist-husband of *Doonesbury's* Congresswoman Lacey Davenport than a celebration of the birdlife of a small patch of greenery in an urban sea. Let the record show that the intrepid birding group recorded Exposition Park's first Northern Pintails, White-breasted Nuthatch, Hutton's Vireo, and Clay-colored Sparrow, adding to an "unofficial list" for the park that stands today at 108 native bird species.

Dick Meier

An aerial view of Exposition Park, south of downtown Los Angeles. The open lawns and the planted trees and shrubs contrast sharply with the urban surroundings and provide habitat for more than one hundred species of resident or visiting birds.

Ornithologists and avian ecologists are increasingly turning their attention to the birdlife of urban regions. Their scientific investigations are two-pronged: On the one hand evolutionary ecologists are interested in the attributes of species that have become successful in highly modified urban habitats. On the other, considerable interest exists in the rates at which native birds in natural habitats disappear as these habitats are fragmented and diminished by urban development. Interest in these topics is reflected in such recent journal article titles as "Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands" (Soule *et al.*, 1988), "Urban cemeteries as bird refuges" (Lussenhop, 1977), and "Value of suburban habitats to desert riparian birds" (Rosenberg *et al.*, 1987).

In few areas of the world is so expansive an urban sprawl superimposed upon so diverse an indigenous bird fauna as in the Los Angeles region. More than 445 native species of birds have been recorded within the boundaries of Los Angeles County, and some 90 of these breed regularly in terrestrial habitats of the Los Angeles Basin and surrounding foothills. But relatively few of these species thrive within the urban "habitats" dominated by concrete, asphalt, and nonnative vegetation. Those that do play an important role in the interplay between human urban culture and the southern California avifauna.

Among the islands of green scattered through the heavily urbanized central part of the Los Angeles Basin is Exposition Park, home for 75 years of the institution we now call the Natural History Museum of Los Angeles County. An open, almost treeless plain prior to development (around 1880) as an agricultural exposition and, ultimately, a sports and museum complex, the park has developed a patchwork flora of trees (eucalyptus, sycamore, live oak, deodar, etc.), geometrically arranged rose bushes, sparse hedges and shrubs, and open lawns.

In much of North America urban wildlife habitat is generally that which remains as urban centers are carved out of natural habitats; most of the important plant species are natives, though their proportions and densities are

In few areas of the world is so expansive an urban sprawl superimposed upon so diverse an indigenous bird fauna as in the Los Angeles region.

highly modified. The plant life of New York's Central Park is a lush amalgam of native species; the park is a well-known birdwatching haven, praised in the writings of John Kieran, Ludlow Griscom, and Roger Tory Peterson, among others. By contrast, the "habitat" in urban Los Angeles is a highly artificial one. The plant species are exotic nonnatives, and the vegetation growth achieves a three-dimensional structure quite different from that of the basin's pristine flora of grassland, oak savanna, riparian woodland corridors, swampy willow bottomlands, and coastal sage scrub. Very few of the trees and shrubs planted in Exposition Park belong to California's native floral roster.

At just over 100 species, plus a handful of established exotics, the birdlife of Exposition Park represents a fascinating mix of adaptable native species, exotic introductions, and transients (some routine, and some well outside the expected range of their species).

KIMBALL L. GARRETT

Although primarily a marine species, the Western Gull has learned to scavenge through urban park refuse. In Exposition Park this role is filled by the Western Gull in the summer months and by the California Gull in winter.

The Exotics

The exotic, introduced bird species of southern California were described in a previous TERRA article (May/June 1986). Perhaps no immigrant bird has a more solid foothold on urban Los Angeles than the House Sparrow (*Passer domesticus*). Not surprisingly, Exposition Park House Sparrows are especially partial to outdoor eateries—many a customer of the Natural History Museum's cafeteria has unwittingly lost a french fry or two to these bold interlopers. Recognizing the House Sparrow's fondness for fast food handouts, Curator of Ornithology Ralph Schreiber and the museum's Bird Council conducted banding operations at the museum cafeteria patio in February and November 1987. The bird banding events were intended as demonstrations of the techniques of capturing songbirds in fine "mist nets," taking data on weights, measurements, and molt, and affixing uniquely numbered leg bands provided by the U.S. Fish and Wildlife Service. In addition, a combination of colored leg bands, unique to each of the 27 sparrows captured, allowed recognition of individuals in the "field."

This technique of marking individuals can help answer fundamental demographic questions about lifespan, reproductive output, and pair bonds. We have banded too few sparrows to yield results in these areas, but have learned a little bit about sparrows' movements between fast food outlets! Male number 1411-44101, bearing a green band on his left leg, was observed feasting at an outdoor eatery on the campus of the University of Southern California on October 2, 1987, eight months after he was banded; he was back at the Natural History Museum ten days later. The male sporting an orange band over the silver numbered band on his right leg (#1411-44116, banded in November 1987) had commuted across Exposition Park to the Science and Industry Museum McDonald's Restaurant three months after he was banded. These movements hardly rival the thousands of miles covered by many migratory species, but at a minimum we have now learned that there is some exchange among the flocks of House Sparrows at Exposition Park's outdoor eateries!

Other familiar exotic bird species in the park and throughout urban Los Angeles include the Rock Dove, Spotted Dove, European Starling, and a variety of parrots and parakeets (again, see TERRA, May/June 1986). Especially frequent in Exposition Park is the Canary-winged Parakeet (*Brotogeris versicoloris*), a South American native; park visitors are often treated to the sight of small flocks of these parakeets tearing open the green pods of the floss-silk trees (*Chorisia*) adjacent to the Natural History Museum, extracting the hard seeds from the fluffy "kapok" fibers.

Most urban wildlife habitat is what remains as cities are carved out of natural habitats; the habitat in Los Angeles is, in contrast, a highly artificial one.

KIMBALL L. GARRETT

The Great Blue Heron hardly qualifies as a typical urban bird, but the species' occasional visits to small city park ponds generate considerable public interest. This individual stopped by the north entrance to the Natural History Museum in the spring of 1989.

Some "exotics" have obviously recently escaped or been released from captivity, rather than representing established populations. This is certainly true of the occasional Cockatiel or Pin-tailed Whydah seen in the park. But how does one explain the beautiful male Lady Amherst's Pheasant that paraded around the Natural History Museum's north entrance in 1986?

The Waterbirds

Many waterbirds, notably the ducks and geese and the shorebirds, are long-distance migrants and therefore likely to overfly urban parks on occasion. Hence we have Exposition Park sightings of such species as Greater White-fronted Goose, Lesser Yellowlegs, Long-billed Dowitcher, and Caspian Tern. I vividly recall a small flock of Cattle Egrets winging over the Los Angeles Memorial Coliseum in the park during the 1985 USC-UCLA football game. But any little patch of water may induce transient waterbirds to linger, and the Rose Garden's central pond and the Natural History Museum's north entrance pools have occasionally filled this role. The Great Blue Heron, Great Egret, Green-backed Heron, and Black-crowned Night-Heron have all spent time fishing in the park's manicured ponds, and a migrant Belted Kingfisher will sometimes plunge in.

Like most urban parks in the Los Angeles basin, Exposition Park has its share of gulls rummaging through the refuse human visitors leave behind. From November through April California Gulls perform a daily commute from nighttime seashore roosts to urban parks, schoolyards, and landfill sites, and in Exposition Park the odd Mew, Herring, and Ring-billed Gull is seen among them. Surprisingly, the Western Gull, normally a strictly marine species, is now seen regularly as a summertime scavenger in the park.

Migrants and Vagrants

To quote Guy McCaskie, mentor of many a California birdwatcher, "Birds have wings...and

The birdlife of Exposition Park represents a fascinating mix of adaptable native species, exotic introductions, and transients.

KIMBALL L. GARRETT

A Canary-winged Parakeet feeding at a seedpod of the floss-silk tree, Chorisia. *Both the tree and the parakeet are conspicuous exotics in Exposition Park.*

they use them!" This little truism was intended to suggest that, at least on a local scale and within reasonable bounds set by a species' life history traits, nearly any species of bird will eventually wander to nearly any locality. The key, of course, is that somebody must be around to record these events. It follows that any well-worked birdwatching site will build up a substantial species list over the years. The ultimate example is certainly Southeast Farallon Island, a chunk of rock less than a sixth of a square mile in area lying some 20 miles off San Francisco's Golden Gate. Daily coverage by the personnel of the Point Reyes Bird Observatory for 20 years has generated a bird list of over 350 species on this windswept, barren islet! The Furnace Creek oasis in Death Valley is a favorite of migrant-hunting birdwatchers, and thorough coverage over the years has yielded more than 320 species at this remote desert site.

Clearly, then, even an urban park will ultimately develop a long list of migrants and "vagrants" (a term denoting migrants that have wandered well outside of their "normal" geographical range—not the unfortunate human park-dwellers the term might initially connote). Over half the bird species recorded in Exposition Park simply migrate over the park or make brief stopover visits. The live oaks and sycamores planted in the park will occasionally harbor a nice spring fallout of tanagers, grosbeaks, warblers, and vireos, and in fall the stand of chinese elms at the southwest corner of the Rose Garden is particularly attractive to these same species.

Many species remain in the park through the winter (White-crowned Sparrows, Yellow-rumped Warblers, and Cedar Waxwings, among others), or virtually throughout the year (Black Phoebe, Red-tailed Hawk, American Kestrel), but nest elsewhere.

Among the rare migrants to have graced Exposition Park are a handful of eastern North American songbirds that have shown a pattern of vagrancy to the West Coast in late spring or fall: Tennessee Warbler, Chestnut-sided War-

bler, Blackpoll Warbler, and Clay-colored Sparrow, for example. Some occurrences have truly defied prediction, most notably the two Least Terns flying over the Natural History Museum one June morning in 1987; the endangered California Least Tern is normally restricted to our beaches and adjacent ocean waters. But we know that transient birds can wander most anywhere; of greater biological interest is the suite of bird species which successfully nest in the urban habitat exemplified by Exposition Park.

Breeding Birds of Exposition Park

The nesting birds of Exposition Park are drawn from a pool of some 90 species that nest in the lowlands and foothills of the Los Angeles basin. We might reasonably predict that species with specialized habitat requirements, such as those of wetlands, forests, or dense low brush, would be absent from the sparsely planted, highly manicured park. Absent, too, would be species whose nesting success is lowered by excessive human disturbance and interference. These logical predictions hold true, and the roster of confirmed nesting species in the park numbers only about a dozen (with a half a dozen other "possibles").

Obviously absent from Exposition Park's breeding avifauna are those species that fail to reach the park in the first place. Some of these absentees are of interest because they thrive in natural and suburban habitats within a few miles of the park. These species include the Plain Titmouse, Bewick's Wren, California Thrasher and Song Sparrow. The familiar Brown (or "California") Towhee has only once reached Exposition Park—a lone juvenile waif perched briefly outside the Natural History Museum Bird and Mammal range on 30 August 1982.

Perhaps the most conspicuous native nesting bird of Exposition Park is a species that has recognized human-built edifices as an excellent substitute for natural cliffs as a nest substrate. These Cliff Swallows build their gourd-shaped mud nest structures over the south entrance to the Natural History Museum each year, apparently having no trouble finding their three major requisite resources—flying insects for food, a sheltered vertical surface for nest attachment, and a source of mud for nest construction. A swallow with quite different nest-site requirements, the tunnel-nesting Northern Rough-winged Swallow, is occasionally seen prospecting nest sites in drain pipes around the Natural History Museum; in what may be the ultimate Los Angeles adaptation, a pair of Rough-wings nests nearby each year under the Santa Monica Freeway at the Normandie Avenue underpass!

One of the most familiar birds of urban areas in the eastern half of North America is the Chimney Swift; as its name suggests, this species has found an appropriate artificial substitute for its natural hollow-tree nest site. (The Chimney Swift's western congener, the Vaux's Swift, still sticks to hollow trees for nesting, in forested areas from central California to southeastern Alaska.) In recent years a few Chimney Swifts have summered in California, and Exposition Park has hosted a small but dependable population since 1983; the park has indeed been one of the most reliable sites in western North America for this species.

The other native birds that have been documented as nesting in Exposition Park were all denizens of open brushlands or light woodland in the region's pristine past. These include the Mourning Dove, Black-chinned and Anna's Hummingbirds, Scrub Jay, American Robin, Northern Mockingbird, Brewer's Blackbird, and House Finch. Other species that may nest in the park occasionally include American Crow, Bushtit, and American Goldfinch.

The List Grows

While it cannot be seriously argued that the artificial habitats of parks such as Los Angeles' Exposition Park constitute nationally significant wildlife habitat, they nevertheless harbor an astonishing diversity of birds. A large and ever-increasing percentage of Americans live in urban areas; their initial and most frequent encounters with the rich birdlife of North America center around the handful of species that have adapted to urban life. Planners of urban parks would do well to recognize the potential these patches of real estate hold for increasing urban residents' knowledge and appreciation of birds and other wildlife (for an interesting analysis, see Penland, 1987).

And with time, the bird list for Exposition Park will grow. Maybe the next species will be a waif, lost over the urban sprawl, finding the park a welcome respite on some seasonal sojourn. Or perhaps it will prove to be a bird from nearby foothill brushlands or woodlands, a vanguard of its kind at an urban frontier. Maybe it will be sighted on the next Dick Davenport Memorial Bird Walk!

Cliff Swallows build their mud nests above the south entrance to the Natural History Museum as well as on similar "artificial cliffs" throughout urban and suburban southern California.

KIMBALL L. GARRETT

Kimball L. Garrett is the Collections Manager in the Section of Ornithology at the Natural History Museum of Los Angeles County. He has written two previous TERRA *articles: "Southern California's Exotic Birds" (May/June 1986) and "Owls and Owling in Southern California" (January/February 1989). The author welcomes documentation of bird sightings from Exposition Park.*

Suggested Reading

Lussenhop, John, 1977. Urban cemeteries as bird refuges. *Condor* 79: 456-461.

Penland, Stephen, 1987. Attitudes of urban residents toward avian species and species' attributes, in Adams, L.W. and D.L. Leedy, Eds. "Integrating man and nature in the metropolitan environment": *Proceedings of the National Symposium on Urban Wildlife*, Chevy Chase MD, 4-7 November 1986. Columbia, MD: Natl. Inst. for Urban Wildlife.

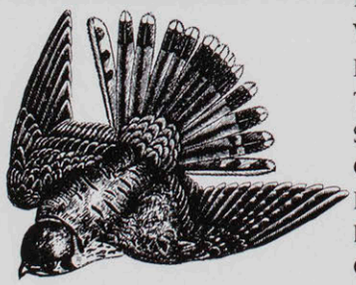
Rosenberg, Kenneth V., Scott B. Terrill, and Gary H. Rosenberg, 1987. Value of suburban habitats to desert riparian birds. *Wilson Bulletin* 99: 642-654.

Soule, M.E., D.T. Bolger, A.C. Alberts, R. Sauvajot, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. *Conservation Biology* 2 (1): 75-92.

Mew Gull

Raven

Great-horned Owl



Kestrel

Bohemian Waxwing

Checklist of the Birds of Exposition Park, Los Angeles County

Residents—Native
Red-tailed Hawk
American Kestrel
Chimney Swift*
White-throated Swift
Black-chinned Hummingbird*
Anna's Hummingbird
Black Phoebe
Cliff Swallow*
Scrub Jay
American Crow
Common Raven
Bushtit
American Robin
Northern Mockingbird
Brewer's Blackbird
House Finch
American Goldfinch

Residents—Introduced
Rock Dove
Spotted Dove
Mitred Conure
Canary-winged Parakeet
Yellow-headed Parrot
European Starling
House Sparrow

Migrant and Winter Visitant Landbirds
Red-shouldered Hawk
Turkey Vulture
Sharp-shinned Hawk
Cooper's Hawk
Peregrine Falcon
Band-tailed Pigeon**
Great Horned Owl**
Short-eared Owl**
Vaux's Swift
Costa's Hummingbird**
Red-breasted Sapsucker
Northern Flicker
Willow Flycatcher
Pacific-slope (Western) Flycatcher
Ash-throated Flycatcher
Dusky Flycatcher**
Western Kingbird
Purple Martin**
Northern Rough-winged Swallow
Barn Swallow
White-breasted Nuthatch**
Brown Creeper**
Ruby-crowned Kinglet
Swainson's Thrush
Hermit Thrush
American Pipit
Cedar Waxwing
Bohemian Waxwing**
Hutton's Vireo**
Solitary Vireo
Warbling Vireo
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler
Virginia's Warbler**
Yellow Warbler
Yellow-rumped Warbler
Black-throated Gray Warbler
Townsend's Warbler
Hermit Warbler
Chestnut-sided Warbler**
Blackpoll Warbler**
Black-and-white Warbler**
American Redstart**
Northern Waterthrush**
MacGillivray's Warbler
Common Yellowthroat
Wilson's Warbler
Yellow-breasted Chat**
Western Tanager
Black-headed Grosbeak
Lazuli Bunting
Rufous-sided Towhee
California (Brown) Towhee**
Lark Sparrow
Savannah Sparrow
Chipping Sparrow
Clay-colored Sparrow**
Brewer's Sparrow**
Fox Sparrow
Golden-crowned Sparrow
White-crowned Sparrow
Dark-eyed Junco
Red-winged Blackbird
Tricolored Blackbird**
Western Meadowlark
Brown-headed Cowbird
Hooded Oriole
Northern Oriole
Pine Siskin
Lesser Goldfinch
Purple Finch

Waterbirds
Double-crested Cormorant
Great Blue Heron
Great Egret
Cattle Egret
Green-backed Heron
Black-crowned Night-Heron
Greater White-fronted Goose**
Northern Pintail**
Killdeer
Lesser Yellowlegs**
Whimbrel
Long-billed Dowitcher
Mew Gull
Ring-billed Gull
California Gull
Herring Gull
Western Gull
Caspian Tern
Least Tern**

Additional Exotics/Escapees
Lady Amherst's Pheasant
Cockatiel
Peach-faced Lovebird
Patagonian Conure
Lilac-crowned Parrot
Yellow-fronted Canary
Zebra Finch
Pin-tailed Whydah

*Summer resident only

**recorded only once in Exposition Park

CARTHAGE
A Mosaic of Ancient Tunisia

by DAVID SOREN

Walking through the jet-set resort that is modern Carthage, the casual tourist would scarcely be aware of the epic struggles of Berbers, Phoenicians, and Romans that went on here thousands of years ago. Yet ancient Tunisia has seen many great civilizations come and go, in part because of its excellent location in the center of North Africa, flanked by Libya to the east, Algeria to the west, the broad expanse of the Sahara to the south, and the Mediterranean Sea leading the way north to nearby Sicily, which is just one day's sail from Carthage. And the fertile Medjerda River, which cuts diagonally across the northern area of the country, provided a way to link the agrarian communities of the hinterland, such as Thuburbo Maius and Thugga, to the major port cities such as Carthage and Utica.

Here and there amid the sumptuous blue and white villas of today's Carthage one can get a glimpse of scattered ruins that were once enormous bath complexes and bustling harbors. With the coming of the forces of Islam at the end of the seventh century A.D. the Carthage of antiquity disappeared until the 1970s when—with the help of UNESCO, the Tunisian National Institute of Archaeology and Art, and archaeologists from a dozen different countries—the story of ancient Carthage began to come once again to light.

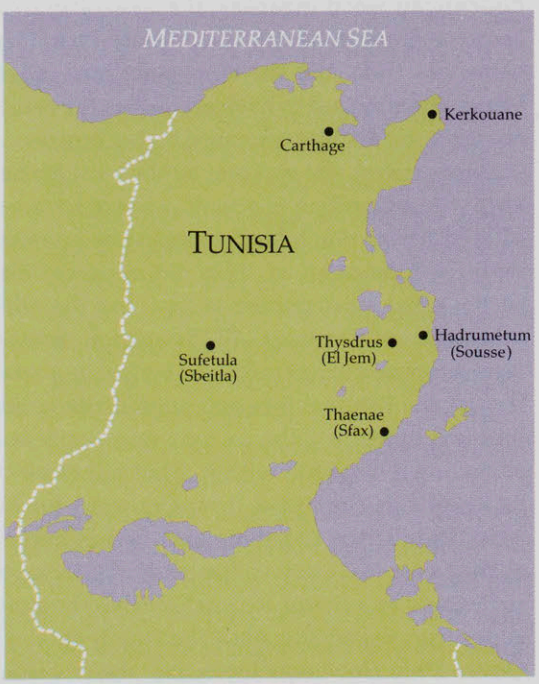
Carthage's Early Inhabitants

The Berbers, who were and are various tribes of nomadic or seminomadic people, were the first important inhabitants of ancient Tunisia, having lived here and throughout North Africa since perhaps the eighth millennium before Christ. They passed their pastoral lives in small tribal confederations known as *aguellids*. Their chief was called a *mas* and occasionally such leaders organized many tribes to form a powerful force across much of North Africa. Berbers, or Libyans as they were sometimes known in antiquity, tended to migrate seasonally with their flocks, carrying or wearing their wealth as they traveled. Some frequented the northern coastal areas, but many retreated to the hinterland, occupying the oases of southern Tunisia to obtain relief from the arid desert climate.

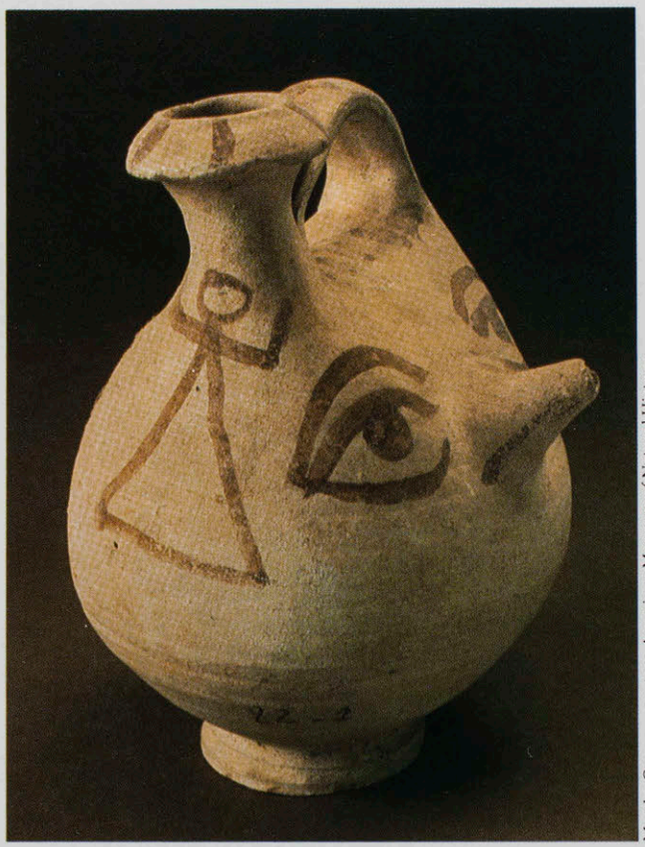
The Berbers left few artifacts, but fortunately they were frequently depicted in Roman times, and Romanized Berbers occasionally left records of their beliefs and ideas. A dedication from the region of Beja (ancient Vaga) from the third century illustrates a pantheon of seven Berber gods with such odd-sounding names as Bonchor, Varsissima, and Vihina. Another sculpture, a stone herm (head on a pillar) from the second-century A.D. Antonine Baths of Carthage shows a strong-featured head of a tribesman whose skull is shaved except for a central hair braid from which a crescent moon pendant hangs.

Today Berbers still make up about one percent of Tunisia's people. They speak their own language (traditionally not written down), which has almost as many dialects as there are tribal groupings. Many live in troglodyte or underground dwellings. Fans of the movie *Star Wars* would recognize such homes in the village of Matmata in eastern Tunisia, for one such complex was used in George Lucas's movie as the home of Luke Skywalker (actor Mark Hamill) and his family on the planet Tatouine, the latter being not coincidentally the name of another Berber village nearby.

Berber dominance in Tunisia came to an abrupt end in the later ninth or perhaps eighth century B.C. with the arrival of colonists from Phoenicia in the eastern Mediterranean. These hardy navigators were far more advanced than their rustic counterparts and were themselves descendants of the sophisticated seafaring Canaanites.



Ancient Tunisia



Martha Cooper, courtesy American Museum of Natural History

This Punic baby feeding bottle from a third century B.C. tomb in Carthage is embellished with the sign of the goddess Tanit. "Punic" comes from a Greek and Latin adjective meaning a Phoenician person; these seafarers settled Carthage in the 9th or 8th century B.C.

The Phoenician Settlers

Ancient traditions recorded by Greek and Roman poets and historians such as Timaeus, Virgil, and Pompeius Trogus attributed the foundation of Carthage (which came from a Phoenician word meaning the new city) to a princess from the beautiful city of Tyre. Her name was Dido, but she was sometimes called Elissa; she was said to have arrived as the result of a dynastic dispute provoked by her brother.

Once arrived, she was met by the local Berber king who, according to several ancient sources, offered her as much land as might be covered with the hide of an ox. This did not seem like such a good arrangement at first, but the wily new queen of Carthage (all Phoenician women were supposed to be crafty, and Dido was a relative of the Biblical Jezebel) solved the space problem by cutting the ox hide into strips and encircling a large hill with it. That hill came to be known as the Byrsa from the word for ox hide. The story is charming and the hill known as the Byrsa still exists in the heart of Carthage, so it would be a shame to conclude that the story is not true, especially since the stately modern Queen Dido Hotel now looks over the city from this spot. But the word *byrsa* may have actually come from the Phoenician way of saying fortress, which the new colony in a strange and hostile land certainly was.

It was here in Carthage that the Trojan leader Aeneas, fleeing from the destruction of his homeland by the Greeks, is said by the epic poet Virgil to have come. Smitten by a divinely inspired love for Aeneas, Dido was heartbroken when he was pushed by the gods to pursue his destiny in Italy. Dido killed herself with Aeneas' sword and threw herself on a funeral pyre as a human sacrifice. The fact that Dido, if she indeed really lived, would almost have to have existed in the later ninth century B.C. and the Trojan War in which Aeneas fought is usually put at the end of the thirteenth or beginning of the twelth centuries should not be allowed to interfere with good storytelling. Perhaps Dido just liked older men.

Between the eighth and fifth centuries B.C. the fortunes of Carthage increased under the royal ruling family known as the Magonids, while the fortunes of the Phoenician motherland, under severe pressure from Assyria, slowly declined. Carthage gradually began to emerge as the mistress of the western Mediterranean and by the fifth century the Phoenician trading emporia, which had stretched all across the Mediterranean from Tyre itself to Gibraltar and beyond, looked more and more to Carthage for leadership. The people of ancient Carthage or their western spheres of influence have come to be known to scholars as the Punic people, a term that comes from the Greek and Latin adjectives *poenos* and *punicus* and refers to a Phoenician person.

At first ruled by a king who was often also commander in chief of the military, Carthage became increasingly controlled by a powerful oligarchy that seemed to enjoy fighting with one another as much as struggling with others. Carthage was a trading empire that used its fleet to keep the Mediterranean a Punic sea. Much of the military consisted of hired help: mercenaries recruited from Punic areas abroad such as Iberia, the Balearic Islands, and even southern Italy, as well as North Africa, where Numidians from the area of Algeria and subjugated Punicized Libyans known as Liby-Phoenicians from Tunisia made up a good bit of the fighting corps.

Early in the fifth century B.C. Carthage found

Martha Cooper, courtesy American Museum of Natural History

A sacred razor from a tomb at Kerkouane (350 to 300 B.C.). Punic razors in the shape of swans may have been part of a ritual shaving ceremony as the body was prepared for the afterlife.

itself locked in a life-and-death struggle with the powerful tyrant Gelon of the Sicilian Greek city-state of Syracuse over control of Sicily. The Greeks in general had no love for the Carthaginians or Phoenicians whom they generally considered smarmy treaty-breaking rivals for their trade routes.

As Syracusan leaders and their allied communities disputed Punic centers in their own country, Sicily became a battleground for decades. A disastrous loss to Gelon by the Carthaginian general Hamilcar at the Battle of Himera in 480 B.C. put an end to Punic hopes of conquest until the end of the century. By this time the Punic forces, with their extraordinary ability to regroup and recover, turned the tables and put an abrupt end to Sicily's golden age with a series of dramatic victories led by Hamilcar's grandson Hannibal (not the famous Hannibal, about whom we shall have more to say later).

The fifth century B.C. was also a time for Carthaginian exploration, as these versatile merchants sought new markets in the west. Somewhere around 465 B.C. (the date is disputed) a man named Hanno, who may have been the ruler of Carthage, took part in an extraordinary *periplus* or "sailing around" of the west coast of Africa. He many not have made it all the way around, but he seems to have established colonies and pushed his way at least as far as what is now Sierra Leone.

To maintain the Punic fleet for overseas trade and the pursuit of new markets as well as naval supremacy, two magnificent harbors were constructed and were reported by the Greco-Egyptian writer Appian:

> The harbors had communication with each other, and a common entrance from the sea, 70 feet wide, which could be closed with iron chains. The first port was for merchant vessels.... Within the second port was an island, and great quays were set up at intervals round both the harbor and the island.... On the island was built the admiral's house, from which the trumpeter gave signals, the herald delivered orders, and the admiral himself oversaw everything.

The commercial and military ports were the scene of major excavations conducted by the University of Chicago Oriental Institute and Cambridge University respectively. The commercial harbor was apparently constructed at some time early in the third century B.C. and

Mosaic head of Medusa from Henchir Thina (Thaenae) near Sfax (Roman, 3rd century A.D.). Images of the Gorgon Medusa were a device intended to ward off evil spirits and bring good luck to the home.

replaced a simpler, earlier harbor that has not been discovered. The harbor was rectangular in shape and lined with warehouses and protected the circular military port, which opened off from it. In the center of the military port were constructions that reached their final Punic form early in the second century B.C., the period Appian was describing, and consisted of a central area that was covered with ship sheds and slipways for pulling up and sliding out the vessels. Because such ships were made of fir wood, they risked rotting if they were left too long in the water.

Traces of Punic houses have been found at various places around the city, including the slopes of the Byrsa hill (French excavations) and the seafront (German excavations). These discoveries show that Carthaginian houses were sophisticated and the periphery of the city was protected by massive defensive walls, the rival of any other such structures built in the Mediterranean. In levels of the fifth or fouth century B.C. the excavators found traces of floors made in true mosaic technique (cut stone cubes called *tesserae* set in a decorative pattern), and these seem to be the oldest examples yet known in the Mediterranean, although the entire matter still inspires great controversy. The Greeks traditionally have been credited with the development of the mosaic technique from simple river pebbles arranged into designs to actual cut and shaped stones for use in floors. The new discoveries will force a reevaluation of the entire question.

Although illnesses such as typhus and/or typhoid seem to have decimated the Punic ranks during the lengthy Sicilian campaigns, new excavations by a Tunisian team at Kerkouane in the northeastern Tunisian promontory of Cap (or Cape) Bon have revealed a well-preserved Punic community of the Hellenistic period (especially the third century B.C.) that is exemplary for its sanitary facilities. Almost every private house has excellent drainage and a courtyard fitted with a hip bath, a kind of tub with a seat and a lower area for placing the feet. What appear to be ample sinks flank the tub area. The tubs seem diminutive to us, but it must be realized that Punic men seldom exceeded five feet four inches in height, and women were often less than five feet tall.

Immediately adjacent to the commercial port was the area known as the Sanctuary of Tanit. Children were buried here who had been cremated; their ashes were swept into burial urns that were then interred in the sanctuary. No other aspect of Punic civilization has engendered so much controversy and strong reaction as this mysterious spot, for it is the alleged center for the child sacrifices recorded by such ancient and, to be sure, anti-Carthaginian sources as Diodorus Siculus, a Sicilian Greek historian of the first century B.C.

Although many anthropologists today believe that child sacrifice was practiced rarely if at all in Carthage, the most recent excavator of the Tophet, Dr. Lawrence Stager of Harvard, believes that the rite may actually have intensified over the centuries until the Romans attempted to stamp it out in the second century B.C.

Carthaginian burials that were not those of children were often made in chambers reached by staircases or in well-like shafts with compartments for the dead opening off from them. Grave goods frequently included what appear to be sacred swan-shaped razors incised with decorations. They may have been part of a ceremony to shave and prepare the body for the afterlife. Elegant gold necklaces with fine work in filigree and granulation also appear, attesting to a productive Carthaginian business making and trading gold jewelry. In the women's tombs abundant evidence of cosmetics are found, including the use of cinnabar apparently as rouge.

The Punic Wars

In the third century B.C. the Syracusan threat had largely died down due to internal disputes in that city-state, but a new and more dangerous power had emerged: Rome. In the eighth century B.C., when Phoenician civilization was already at its zenith in Tyre, Rome was barely more than a collection of villages of primitive huts and sheepfolds. But in the fourth and third centuries the Romans expanded throughout Italy and became a dominant force in southern Italy.

The three confrontations between Rome and Carthage, between 264 and 146 B.C., were known as the Punic Wars. Carthage lost all three, but not without a substantial struggle in each one. During the first confrontation, the Punic fleet was bested in battle off Mylae in

Martha Cooper, courtesy American Museum of Natural History

northeastern Sicily; never again would Carthage be unrivaled mistress of the sea.

In the Second Punic War (218-202 B.C.) the Carthaginians came very near to destroying the Romans. Using their traditional base in Spain, where the Phoenician language had been spoken for six hundred years, the ruling Barca family began a long effort for consolidated control of the western Mediterranean and the development of a successful staging base for a new war with Rome. After several earlier leaders paved the way, command of the army fell to Hannibal, the 25-year-old son of the late Hamilcar Barca, former scion of Carthage's ruling aristocracy and architect of the Iberian policy.

Hannibal had spent a lifetime learning military strategy from his father and applying it against the fierce Iberian tribes, and he was eager to avenge the earlier Carthaginian losses to Rome; in fact, as a little boy, he had sworn an oath to his father to do so. He led a series of carefully crafted attacks against pro-Roman communities in eastern Spain and, leaving an army behind to deal with a Roman counterattack, marched boldly across the Alps with his mercenaries and a train of elephants, traversing regions of hostile mountain tribes and finally arriving in northern Italy with only one elephant.

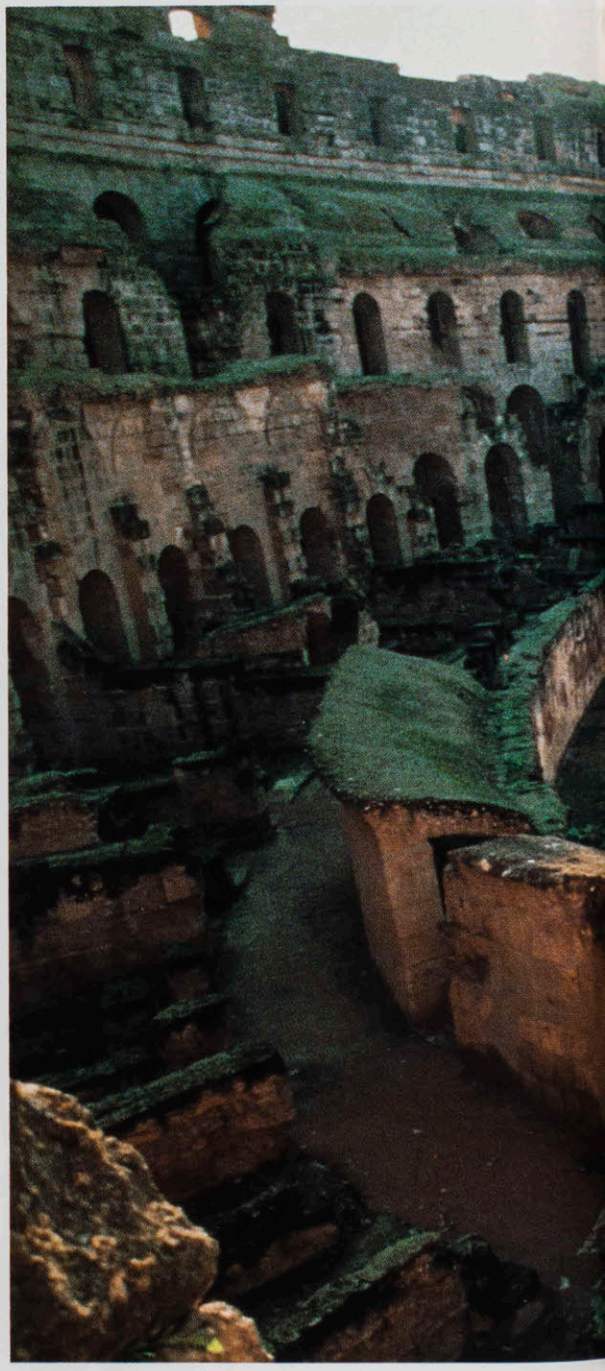
Hannibal was a master at military strategy while the considerably more sizeable Roman army was lacking in skilled veteran commanders and discipline. Hannibal was able to lure Roman troops into ambushes, outflank them repeatedly, and cut them to ribbons, while at the same time laying waste to fertile Italian soil.

Hannibal had hoped that other communities in Italy would flock to his side and although some did, others felt that exchanging a Roman landlord (a devil they knew) for a Punic one (a devil they didn't know) was risky business, and, for the most part, life was not all that bad under the Romans, who at least did not destroy their countryside.

With the failure of the Italian revolt anticipated by Hannibal, his campaign gradually ebbed, although it took fully sixteen years for the Romans to wear him down, using delaying tactics out of fear of direct confrontation. Iberia was eventually lost, and he was forced to return to Carthage to defend himself against a truly brilliant young Roman general named Publius Scipio Africanus. At the decisive battle of Zama Hannibal was defeated, and Carthage was forced to pay an enormous indemnity.

Far from being the end of Carthage, the city recovered quickly and was able to pay off the debt to Rome by early in the second century B.C. Hannibal stayed on in Carthage as one of the leaders *(suffetes)*, helping to turn the city of Carthage into one of the most democratic communities of the Mediterranean. He was forced to flee, however, when the antidemocratic, anti-Barca party in Carthage informed the Romans that he was intriguing to stir up another war against Rome.

Carthage was now threatened by yet another enemy, the fearsome Masinissa, a Numidian chieftain who had organized and stirred up the *aguellids* across North Africa into a pan-African movement. By the 150s B.C. he commanded an empire that stretched from his native Algeria (Numidia) across the desert oases of Tunisia into Libya. Masinissa's repeated incursions into Carthaginian territories forced retaliation by Punic leaders in violation of the Punic treaty with Rome, and this resulted in a series of delegations sent from Rome to investigate.



View of the interior of the amphitheater of Thysdrus (3rd century A.D.). Animals used in gladiatorial combat were kept below the arena and raised by pulleys to the surface.

Despite the fact that the family of the Scipios repeatedly urged moderation with Carthage, one of the members of an important Roman delegation was terribly alarmed. Marcus Porcius Cato, the self-proclaimed guardian of the morals of the Roman people, urged that Carthage must be destroyed once and for all. Plutarch reported his reaction:

> He drew the conclusion that this was no time for the Romans to occupy themselves with regulating the affairs of Masinissa and the Numidians, but that unless they found means to crush a city which had always borne them an undying hatred and had now recovered its power to an incredible extent, they would find themselves gravely threatened as before.

The Third Punic War (149-146 B.C.) began badly for the Romans, but the demise of Carthage was accomplished by another military leader of the Scipio family: Publius Cornelius Scipio Aemilianus. His destruction of the Punic

Noelle Soren

city was absolute, and Carthage burned for six days as the once-proud temples, elegant homes, and highrises were razed and the ground sown with salt. The cursed land was intended to lay in ruin forever, but it was not to be. Carthage, which had to be destroyed, rose again.

The Romanization of Carthage

Throughout the rest of the second century B.C. and into the first century, Roman entrepreneurs began opening up the hinterland of *Africa Vetus*, as northeastern Tunisia came to be known, for the exploitation of olive oil and wheat. The latter was in particularly short supply in Rome due to overcultivation and bad agricultural management in Sicily, and it was needed for the dole to keep the 200,000 urban poor from rising up in revolt. Olive oil was always expensive in Italy, and Africans who came to live in Rome (like Saint Augustine) were always complaining that they had to spend their evenings in the dark because there was no fuel for lamps.

As the process of Romanization continued, many of the Punic people who had defected from the cause of Carthage and embraced the Roman conquerors managed to enjoy a reasonably good life without penalty of reprisals. The poor Berbers and the Punic resistance were less fortunate and indeed most of the wealth of the new province was concentrated in the hands of a very few families. Recent estimates suggest that five-sixths of the people of North Africa at that time lived at the poverty level.

With the advent of Rome came the amphitheaters, enormous arenas where gladiators fought or fighters known as *bestiarii* contested with wild animals brought from the hinterland of Africa. Leopards, elephants, wild boars, and the like stalked the ground while condemned slaves or criminals struggled against them. Sometimes gladiators could make a name for themselves in the arena, but for the most part it was a dangerous affair with death waiting at every step. The animals became famous too, being given names like Victor.

With the Berber tradition of the great hunt and their fierce ability to fight, the games of the amphitheater, which often included all sorts of bizarre handicap matches, became extremely popular. The city of Thysdrus had no fewer than three amphitheaters, the first a makeshift affair built by Romans who settled there around the time of Christ and the final one a colossal palace of spectacle worthy to stand next to the Colosseum in Rome as a major monument.

By the later first century B.C. *Africa Vetus* had been extended to the south and west and the province of *Africa Nova* was created. By the time of Augustus the two were combined and became known as *Africa Proconsularis* while Carthage was being laid out anew. Since Rome was now able to produce a good quantity of olive oil and wine and did not want to undermine its own markets with foreign competition, Africa was turned into a one-crop economy, becoming known as "the granary of Rome" and "the land of goddess Ceres." Later in the first century A.D. the olive oil production was stepped up once again; a new international industry also emerged: the making of fine ceramic table ware. This glossy orange pottery in relatively simple open forms or cups without elaborate profiles proved popular all over the Mediterranean as a cheap but elegant substitute for more expensive pottery or metal wares. It has come now to be called African red slip ware and it remained in production well into the seventh century A.D. At centers like Mahdia one can see the large ovens used for producing it although the ware was made at a number of sites, including, no doubt, Carthage.

The wealthy class lived a life of ease as proprietors of vast landed estates sometimes called *latifundia,* which were like medieval fortresses and sprawled over vast areas. Many landowners were absentee and left the running of their estates to more or less qualified middle-class men. Some landowners or middle-level managers were extremely cruel, necessitating legislation to curb unfair treatment of the poor. *Coloni* were like indentured servants who received a tiny parcel of land, but had to pay a tribute to the rich, a situation that was often abused. An appeal by one group to the emperor, made in the later second century, spoke of an evil tenant-in-chief who

> has dispatched troops to the *saltus Burunitanus* [a particular pasture-land] and given orders for some of us to be roughed up, others fettered, and some, even though they are Roman citizens, to be flogged with rods and cudgels. The sole reason advanced for this treatment was that we had written an outspoken letter, imploring your Majesty's aid, since we find ourselves suffering ill-treatment so severe and so blatant in proportion to our weakness, and this has forced us wretched men to look once again to your divine foresight for aid.

In the sumptuous villas the rich men might have spent much of their time looking over their domains, but for enjoyment they looked forward to a great hunt, the ultimate ancient African sport. Even though they might just be chasing hares or small game, the event might be celebrated as if the wealthy men were Alexander the Great stalking lions. One villa in the Dermech area of Carthage features a magnificent hunting scene portrayed in a floor mosaic of the fourth century A.D. On it all sorts of wild animals are fought or captured. In one sequence a bouncy little hunting dog, fitted out with studded collar and a chest protector, proudly looks up at the wild boar he has flushed out for several hunters to carry away on a spit.

On the same mosaic a more elaborate sequence shows lions being lured out of a cave.

Carthage: A Mosaic of Ancient Tunisia

September 9 through January 7, 1990

This famous mosaic from Thysdrus shows the events the day before a gladiatorial contest. Various gladiator troops are represented at a banquet in the arena as bulls (zebus) recline. Proceeding from the viewer's right the first says in Latin to several companions: "We three are getting along well." The next participant observes: "Let us amuse ourselves," and this is followed by: "Enough talk." Another reminds the group: "We have come here to drink." Finally, a character at the end of the mosaic leans backward, his legs crossed, as he waves the ivy leaf of Bacchus, god of reverlry. His comment might best be translated: "Let's take all our clothes off." Below the banqueters in the arena some servant boys are trying to instill silence in the rowdy bunch as the zebus, each carrying a brand, stir. The boys call out: "Let the sleeping bulls lie."

Martha Cooper, courtesy American Museum of Natural History

Carthage: A Mosaic of Ancient Tunisia presents the most comprehensive view of ancient Tunisian life and culture ever exhibited in the United States. Enormous brightly colored mosaics, outstanding Roman bronzes, and a collection of rare Punic jewelry will paint a picture of the region as an ancient center of culture, history, and art.

This exhibition is organized and sponsored by the American Museum of Natural History, New York City. The art objects and artifacts are on loan from the Institut National d'Archéologie et d'Art, Tunisia. The exhibition is funded in part by the National Endowment for the Humanities and is supported by an indemnity from the Federal Council on the Arts and Humanities. It is sponsored locally by Chase Manhattan Corporation and Royal Athena Galleries, with additional support from Ralph Khelil.

A captured wild boar is trussed to a pole as a hunting dog with a studded collar and chest protector looks up. From the Dermech (Carthage) Hunt Mosaic of the early 4th century A.D.

A goat has apparently been stuffed and then used as a decoy by being mounted on a wheeled cart and shaken. Behind the goat is a large wooden box with a vertically sliding trapdoor on top. Once the lion ventures inside, a man hiding on top of the box lets the door slide down, and the lion could then be put on the animal transport ship and packed off to one of the arenas of the Roman world.

During the Roman period mosaic making reached its zenith, and Carthaginian craftsmen were even employed overseas to do the mosaics for such establishments as the early fourth-century imperial villa at Piazza Armerina in Sicily. The abundance of good stone made mosaic production inexpensive in ancient Tunisia; each region had its own special colors and styles. African mosaicists from the later first century A.D. on preferred a rich polychromy on their floors while Italian mosaicists

Martha Cooper, courtesy American Museum of Natural History

used primarily black and white stones. Marble or limestone would usually be employed, but for special mosaics, some of them separately inset *emblemata*, glass cubes might be used.

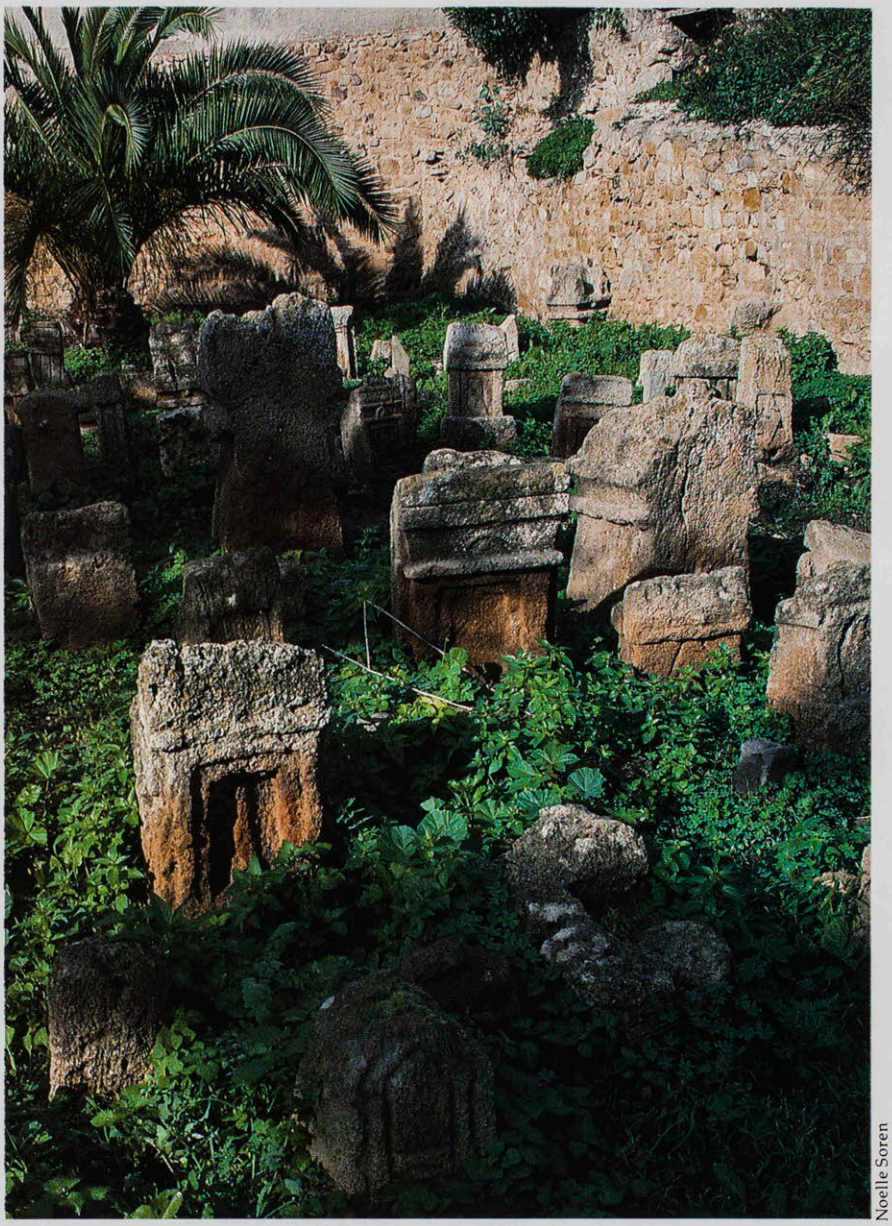
By the second century A.D. the prosperity of Africa had become legendary. Carthage was an important university town (Saint Augustine studied here in the fourth century), but there were other communities that had blossomed into small metropolises: Sufetula, Dougga, Thuburbo Maius, Mactar. And the city of Thysdrus had become so important that its forum was of enormous size, although few remains of it have yet been recovered. The endless stream of grain, olive oil, wild animals, and various other foodstuffs and specialty items had made the wealthy classes wealthier and had even provided possibilities for some lower class citizens to improve themselves. A harvester from Maktar had this to say on his tombstone:

> I was born in a poor household; my father was poor, with neither property nor a house of his own. From the day of my birth I have lived by working my land; neither my land nor I has ever had a rest.

After twelve years of labor as a migrant worker in the border areas between what is now Tunisia and Algeria, and after some eleven years as a foreman, he managed to buy a farm and to become a senator and censor in his town. He ends by stating:

> I have seen my children and my grandchildren grow up around me, and I have enjoyed years distinguished by the merits of my career—years have brought no accusation from any malicious tongue. Learn, mortals, how to live free from accusations. Thus has he deserved to die who has lived honorably.

With the Romanization process came the Roman divinities who were rapidly fused or syncretized with the traditional Punic and Berber or Libyan gods. Ba'al Hammon became more commonly known as Saturn while Melqart, originally the city god of Tyre, was now Hercules and the Punic Temple of Melqart on the Spanish coast at Gadir (Gades or Cadiz) became commonly known as the Pillars of Hercules. Resef, whose temple once graced Carthage, was now Apollo. Tanit became Juno Caelestis and kept her astral qualities; her temple at Dougga, although Roman, was sur-



Noelle Soren

View of the Tophet of Carthage showing funerary markers known as cippi.

rounded by a crescent-shaped courtyard that mimicked the crescent Tanit symbols on the *stelae* of Carthage.

The Breakdown of the Roman Empire

But the prosperity could not endure forever. In the third century A.D. the Roman empire experienced years of instability as rival factions vied for the imperial crown. Africa too played its role in the crises as Gordian, the 81-year-old proconsul of Africa, was apparently crowned emperor in A.D. 238 at Thysdrus and briefly obtained the support of the senate of Rome. But his reign was short-lived; he fell near Carthage to troops fighting in support of the seven-foot-tall Thracian claimant to the imperial throne, the cruel Maximinus.

Equally divisive were the religious schisms that factionalized African religious leaders. With the breakdown of order in the empire in the third century, alternative religions and religious philosophies gained a foothold, including Christianity. Church leaders and their followers disagreed on whether or not a person could remain a good Christian if he or she caved in to the demands of the Romans to sacrifice before the imperial shrines or give over the scriptures to Roman authorities. The *coloni*, Libyans, slaves, and runaways with little to lose, tended to support a strong anti-Roman position while those with lots of money and land found it more expedient to make "deals." The result was a religious-based class struggle that contributed enormously to the fragmenting of the province.

By the time the Vandals (who were themselves Christians, but believers of what has been termed the Arian heresy) were able to take over control of Carthage early in the fifth century, the Roman foundations had been severely undermined. It was not that the Vandals were so powerful and overwhelming. They were not, and they were not very good administrators. By their time the Roman emperors had long since left Italy and relocated in Byzantium (Constantinople) as barbarian hordes threatened to take over control of western Europe. The Byzantine forces of Justinian reconquered Africa and defeated the rapidly fading Vandals, about the middle of the sixth century A.D.; for some decades it seemed as if the old Roman rulers (albeit now eastern Roman rulers) had returned, but the quality of life was never again to reach the zenith attained in earlier times.

Islam and Carthage

A new and more powerful force, Islam, was waiting in the wings, prepared to spread its influence with a devotion and zeal that did not waste time in theological debate among rival factions as the Byzantine people did. By the late seventh century A.D. the Carthage of antiquity was no more, and the province of Africa, overrun by the Arabs, became transformed under the new masters.

Under numerous Islamic dynasties and later Turkish and French domination, before independence was finally achieved in 1957, the face of what is now called Tunisia would change again and again. As the Punic and Roman cities faded from memory and became overgrown ruins, colorful mosques with their minarets replaced them along with massive rabats, twisting souks of the medinas or old city areas, and finally palaces of the beys with stunning glazed tiles, creating a new landscape over the passing centuries. Beginning in the nineteenth century, French culture gave a slight western overlay to the proceedings, and today in the capital city of Tunis abundant traces of modern, international architectural style has yielded everything from baby blue skyscrapers to hotels that look like upside-down triangles.

Building on the legacy of independence developed for thirty years by President Habib Bourguiba, who was known as Tunisia's freedom fighter extraordinaire, current President Zine El Abidine Ben Ali has already expressed his concern to recognize his country's great past and look proudly to the future:

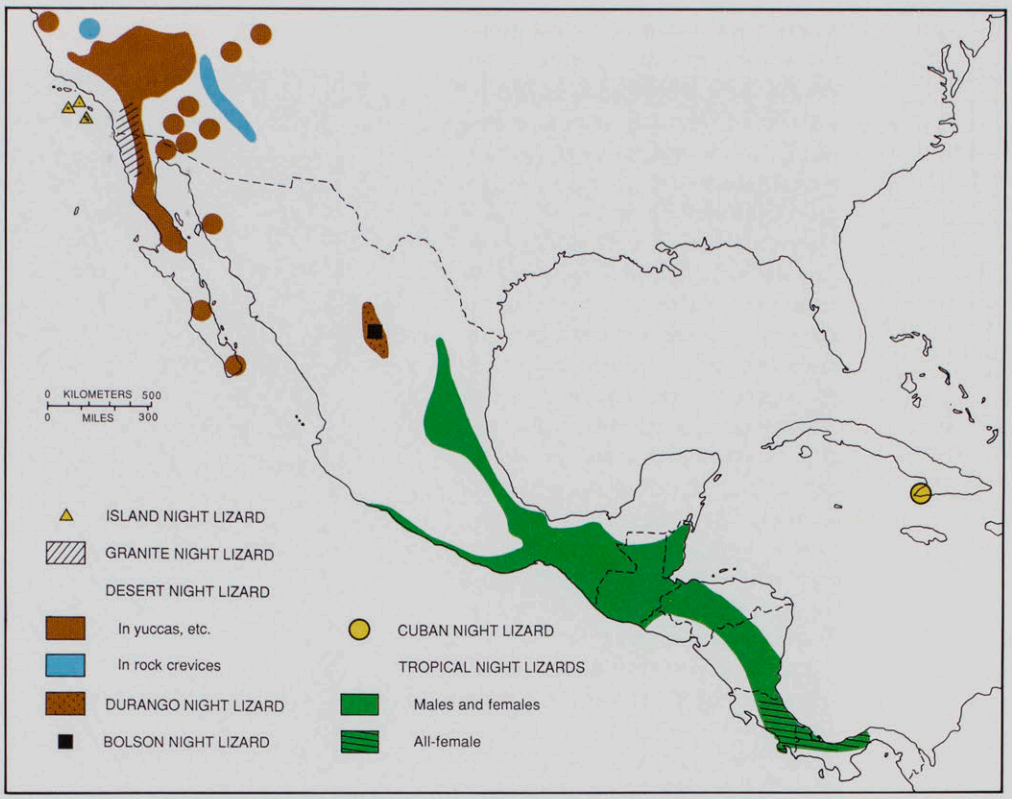
> Carthage was a center for the creation and dissemination of culture, science, and technology.... Founded by Easterners from the Lebanese coast, Carthage went beyond its roots to integrate itself into a metropolis with a major universal influence.... Today's Tunisia is proud to be the heir of Carthage in the sense that we wish to remain a land of peace, a meeting place of friendship and culture.

David Soren is a pioneer in the field of seismic archaeology, the excavation of cities buried by earthquakes. He has served as Chairman of the Department of Art History and Archaeology at the University of Missouri and is now Professor in the University of Arizona's Classics Department.

NIGHT LIZARDS
The Evolution of Habitat Specialists

by ROBERT L. BEZY

Large treelike yuccas known as Joshua trees dominate the Mohave Desert landscape and have come to symbolize this harsh region. These massive spiny plants may appear rather inhospitable, but they are home to many animals. One such inhabitant, and one of the smallest American reptiles, is the desert (or yucca) night lizard. Unlike the lizards commonly seen dashing across the desert floor in the heat of the day, these small animals—less than four inches (10.2 cm) in total length—spend most of their lives without leaving the protective confines of the decaying branches of a single yucca. Downed by the strong winds which buffet the Mohave, the branches litter the ground beneath the plants and protect the lizards from both predators and the thermal extremes of the desert.



The nineteen species of night lizards range from Utah to Panama, and many of their populations are geographically isolated.

Little is known about the lives of these lizards in the Joshua tree litter. In spite of their name, they are not strictly nocturnal, since they may be active at different times of the day or night depending on temperature. With their catlike elliptical pupils they are well-adapted to the dark labyrinths of the yucca logs where they hunt ants and other insects for food. Their movement through these passageways is facilitated also by their small size and the relative shortness of their limbs. In good years they give birth to a single litter that usually contains only one or two young, but in leaner years they may not reproduce at all. In the protection of the yuccas they have few predators and may live for nearly a decade, a rather long life for a lizard of such small dimensions. Thus, although the birth rate of the species is low, its survival rate is high. Fairly dense populations of these reptiles are present in most Joshua tree stands (about 20 lizards per acre).

The close association of the desert night lizard (*Xantusia vigilis*) with the Joshua tree (*Yucca brevifolia*), and with yuccas in general, has fascinated naturalists since the time of its discovery in 1895. As additional species of night lizards have become known, they also have been found to be highly specialized for particular habitats. There are nineteen species in the night lizard family (the Xantusiidae) ranging from the deserts of Utah to the rainforests of Panama. Some populations are separated by hundreds of miles from all other members of their species, and there are others that consist exclusively of females. How long have the populations been isolated from each other? How did the all-female populations originate? What role has habitat specialization played in the group's survival and evolution? These are some of the intriguing questions that I have pursued in attempting to unravel the evolutionary history of these lizards.

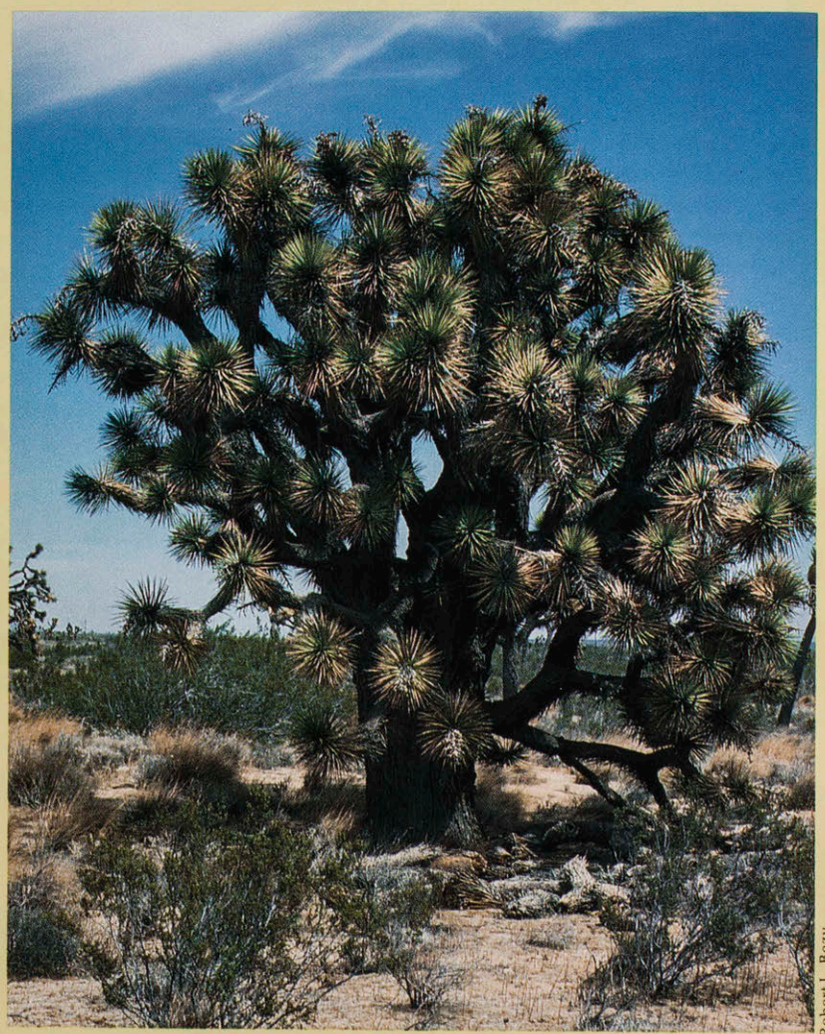
Rock crevices constitute one of the habitats that is important in the group. The granite night lizard (*X. henshawi*), found in southern California and northern Baja California, lives almost exclusively beneath the slabs or spalls of weathered granite boulders. With a flattened body form that permits them to move about in the narrow spaces beneath the slabs, they are well-suited to their surroundings. Compared with the desert night lizard they are larger and have relatively longer legs and toes, the last two representing adaptations for climbing. Their upper body surfaces are darkly spotted and the lizards are difficult to detect during their occasional forays into the evening shadows along the edges of the crevices or onto the exposed surfaces of the boulders at night.

In habitat, body form, color pattern, and details of their scales the granite and desert night lizards are quite different. They sometimes live in close proximity, such as along the base of the San Jacinto Mountains near Palm Springs

where yuccas can be found growing among granite boulders, but the two species are not known to interbreed. Thus, it was surprising to discover several populations with features that are somewhat intermediate between the two. These are found around the margins of the geographic range of the desert night lizard away from the area of contact with the granite night lizards. At each locality the animals live in the crevices of granite or other boulders and they appear to be specialized to varying degrees for this habitat. As these localities are quite isolated from one another, I wondered how many times populations may have independently evolved adaptations to the rock crevices.

To answer questions such as this it was necessary to obtain a more direct assessment of the genetic relationships among the populations. In collaboration with Dr. J. W. Sites of Brigham Young University, biochemical techniques were used to compare the primary products of genes (such as enzymes) from various populations and species of night lizards. As most of the evolutionary changes in these gene products do not affect either their function or the animal's survival, they are largely independent of natural selection and habitat. Consequently, the genetic relationships indicated by studying these gene products are ideally suited for answering some of the questions about night lizards.

From such analyses I succeeded in obtaining information crucial for understanding the evolutionary history of the group. The studies revealed that the various populations that live in the same habitat may not be closely related, but that their similarity in appearance may be due to convergent evolution, the process by which populations come to resemble one another as a result of each independently evolving similar adaptions to the same ecological conditions.



Robert L. Bezy

Perhaps the best example of this process involves two populations found in north-central Mexico. These occur in the southern Chihuahuan Desert in the state of Durango separated over 400 miles (640 km) from other members of the group. One of the two (the Durango night lizard, *X. vigilis extorris*) lives in yuccas and agaves and closely resembles some populations of the desert night lizard.

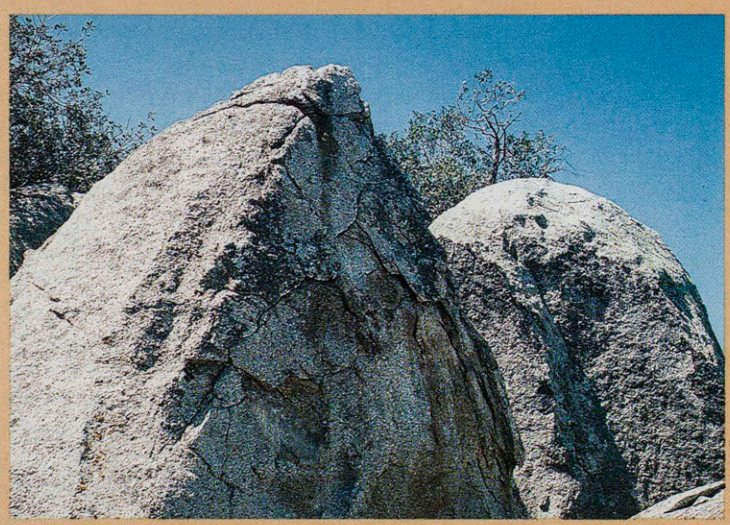
Page 31, left: The flat body and dark color pattern of the granite night lizard (Xantusia henshawi) *are well-adapted to the rock crevices it inhabits.*

Page 31, right: As boulders weather, the outer layers slowly crack and separate, producing the crevices in which the granite night lizard spends most of its life.

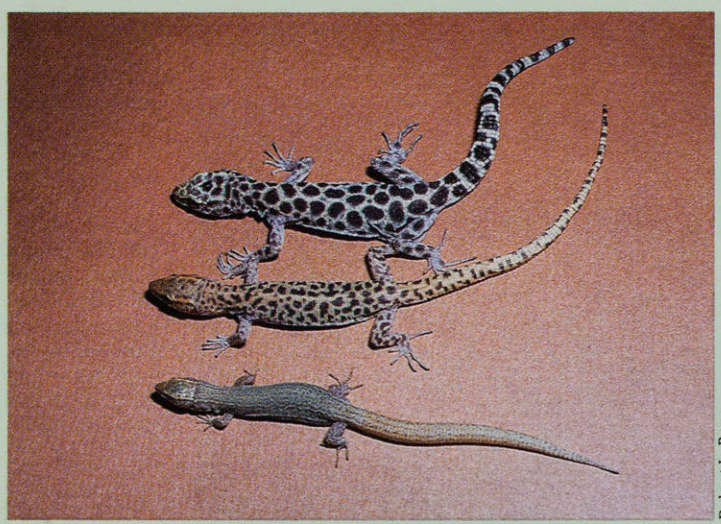
John De Leon

The fallen branches of Joshua trees (Yucca brevifolia) *are inhabited by the desert night lizard* (Xantusia vigilis) *and provide food (mostly insects) and protection from predators and the harsh climate of the Mohave. Due to its diminutive size the lizard is able to move through the labyrinths within the yucca logs.*

Dick Meier



Robert L. Bezy



Robert L. Bezy

Robert L. Bezy

Although the Bolson night lizard (Xantusia bolsonae; *in the middle*) *resembles the granite night lizard* (Xantusia henshawi, *upper*), *it is most closely related to the Durango night lizard* (Xantusia vigilis extorris, *lower*).

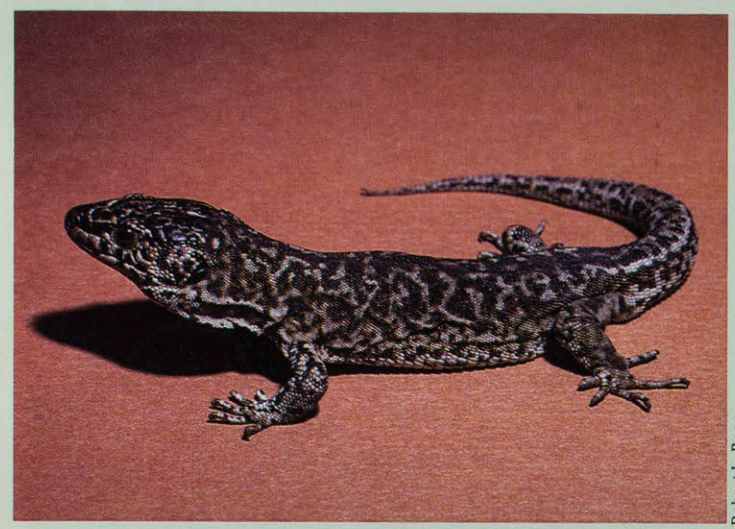
The Bolson night lizard lives in the crevices of andesite boulders on small hills surrounded by yuccas and agaves that are inhabited by the Durango night lizard. These populations are in the southern Chihuahuan Desert isolated over 400 miles from their other relatives.

The other (the Bolson night lizard, *X. bolsonae*) is found in the crevices of andesite boulders on the adjacent hills and is similar to the granite night lizard. On the basis of these similarities in life style and appearance it was thought that the two populations in Durango are each most closely related to a different population, one that is geographically distant but occupies a similar habitat. Thus it came as a surprise when our analyses revealed that the two Durango populations are nearest relatives, that is, they are more closely related to each other than either is to any other night lizard. Unfortunately, genetic relationships cannot tell us which habitat was occupied by their common ancestor. If the ancestral population lived in yuccas and agaves, then the Bolson night lizard must have subsequently become adapted to rock crevices, and its similarities to the granite night lizard are the result of convergent evolution. Conversely, if the ancestor lived primarily in the rocks, then the Durango night lizard later became adapted to plants and has secondarily come to resemble the desert night lizard. Regardless of the original habitat, convergent evolution must have occurred in one of the two populations. Comparisons among other populations further suggested that this process has occurred repeatedly in the group's history as various populations independently specialized either for rock crevices or for yuccas and agaves.

The Durango populations illustrate another recurrent theme in the group which has had a major impact on its evolution, that of geographic isolation. Within some species, the populations are separated by large expanses of terrain where no night lizards are extant today, perhaps a direct consequence of their present-day restriction to specific habitats. At one time or another each population was connected with its relatives, but the genetic information indicates that some populations of the desert night lizard have been isolated for an extraordinary amount of time (over eight million years).

Two species are restricted entirely to islands. The Cuban night lizard (*Cricosaura typica*) occurs exclusively in the Cabo Cruz region of southeastern Cuba, and it is the only member of the group to be found in the West Indies. The species is quite different from all other night lizards, and it may represent an ancient relict isolated since the time of the archipelago's formation.

The island night lizard (*X. riversiana*) lives only on three of the California (Channel) Islands: Santa Barbara, San Clemente, and San Nicolas. It is much larger than its mainland relatives (the desert and granite night lizards) and may be an example of *insular gigantism*, the general tendency of some species to become larger on islands. How long has it been isolated on the islands and how did it get there? Here, the genetic data suggested that the evolutionary split between this species and those on the mainland began in the Miocene (about 15 million years ago), or approximately the time that geologists believe San Clemente Island may have separated from the Baja California coast and began drifting northward. This suggests that the species may have



Robert L. Bezy

*Found exclusively on three of the Channel Islands (San Clemente, San Nicolas, and Santa Barbara), the island night lizard (*Xantusia riversiana*) is much larger than its mainland relatives.*

Robert L. Bezy

The island night lizard lives beneath rocks and is most common on the flats just above the shoreline. Due primarily to the ecological effects of introduced mammals (goats, cats, pigs, etc), its survival is in question and it is listed as a threatened species.

originated as a result of its island isolation and may have never occurred on the mainland. However, for this to have been the case, the island must have remained above water for the past 15 million years. Although the geological record preserved on the islands is far from complete, it indicates that they were probably under at least shallow water in the late Miocene (about 10 million years ago). Thus, we are left with the much more complex explanation that the species originated on the mainland, subsequently reached all three islands by one means or another, and then became extinct on the mainland.

The remaining dozen species of the family occur from Mexico to Panama and belong to a group collectively called the tropical night lizards (genus *Lepidophyma*). Members of this group are characterized by having large conical scales projecting from the sides of their bodies. These lizards occur in a variety of habitats, including caves, boulders, and logs, and from lowland rainforests to montane coniferous forests. One species (*Lepidophyma smithii*) that occupies caves and labyrinths under large piles of boulders near Acapulco, Mexico, has been discovered to feed largely on the fruit that falls from overhanging fig trees. Another species (*L. gaigeae*) lives almost exclusively in limestone crevices along the Sierra Madre Oriental of northeastern Mexico. Compared with most other tropical night lizards, it is smaller, has a flatter body, and almost completely lacks conical scales. Once again, genetic relationships indicate that these similarities to other crevice-inhabiting species result from independent adaptations to a similar habitat rather than from common ancestry.

In the rainforests of Panama and Costa Rica, tropical night lizards are most often found in large rotting logs and tree stumps where populations have been discovered that consist exclusively of females. Reproduction has not been investigated in these particular all-female populations but it is probably similar to that of unisexual species in other groups of lizards, some of which have been studied in detail. There are over 30 known species of all-female lizards, and it is likely that they all reproduce by a process known as *parthenogenesis* in which the eggs develop without being fertilized by sperm. Many of these species have been found to have originated as hybrids between two different species, that is, as a result of the mating of a male of one species with a female of another. Although most hybrids are sterile, it appears that an occasional individual hybrid female has the capacity to reproduce without fertilization, and she may give rise to a self-perpetuating line of all-female lizards.

The all-female night lizards present an unusual situation. In one species (*Lepidophyma flavimaculatum*), the populations in Mexico and upper Central America have males, whereas those in Panama and in most of Costa Rica lack them. I have compared the color patterns, scales, chromosomes, and protein genes of the populations, and so far I have not detected any differences except for the presence or absence of males. Moreover, nothing in the available information suggests that these all-female populations are of hybrid origin. But how they

Robert L. Bezy

Some populations of this tropical night lizard (Lepidophyma flavimaculatum) *consist exclusively of females.*

Robert L. Bezy

The all-female night lizards are found in large rotting logs and tree stumps in the tropical forests of Panama and Costa Rica.

actually arose remains a mystery. As with most biological attributes, the ability to produce eggs that can develop without fertilization undoubtedly has a genetic basis and is subject to natural selection.

Certainly, the ecology and habitat of these tropical night lizards may favor females with genes for unisexuality. The tree falls and associated rotting logs inhabited by the lizards are relatively rare in the undisturbed rainforest and usually are separated by large distances. Once a tree has been downed, the chances of one lizard encountering it are low, and the chances are even lower for two. Needless to say, in the absence of unisexuality either an already gravid female or a male and a female must reach the fallen tree, whereas a lone unisexual female, gravid or not, can found a colony. Moreover, if all of her offspring are also unisexually reproducing females, the colony has the potential for very rapid growth, allowing it to make maximum use of this large but ephemeral resource. Considering the size of the logs it is likely that they would provide the lizards with food and protection for many years. Once this temporary resource has dwindled, it would again be the unisexual lizards which would have the best chance of dispersing to another log and establishing a new colony. Thus, it appears that habitat specialization and dispersal distance may have played a part in the origin of these all-female populations.

My research on night lizards reveals that convergent evolution has occurred repeatedly in the group as populations independently adapted to similar habitats and that this process may have been facilitated by the extreme isolation of some populations in both space and time. It also suggests that parallel forces may have been important in the origin of the all-female populations. Ironically, it was these very features of night lizards—their unusual habitats and geographic isolation—that initially made them attractive for study, but only through genetic information obtained from biochemical comparisons have I been able to appreciate fully the critical role that these ecological factors have played in the group's evolutionary history.

Robert L. Bezy is Associate Curator in the Section of Herpetology of the Natural History Museum of Los Angeles County. He received his Ph.D. from the University of Arizona and has published over a dozen papers on night lizards. He is interested in amphibians and reptiles in general and his research has concentrated on the systematics of lizards.

MEMBERSHIP IN THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

BECOME A MEMBER OR GIVE A GIFT THAT WILL LONG BE REMEMBERED

Members receive a personal NHM membership card, which gives an amazing variety of benefits:

- Unlimited free admission to NHM and the George C. Page Museum
- Admission to the Hart Museum and El Dorado Nature Center
- Exclusive discounts at four extraordinary *gift shops*
- Advance notification of films, lectures, performances, and *more*
- Subscriptions to both of our award-winning publications, TERRA magazine and the Calendar of Events
- Invitations to our Members Open House and Member Preview Opening
- Exclusive once-in-a-lifetime travel opportunities, both near and far
- Two FREE tickets to all our exciting special ticketed exhibitions

Additional benefits are offered at *higher levels* of Membership.

JOIN TODAY!

Membership dues are tax-deductible to the extent of the law. Please send this application with your payment to the Membership Office, Natural History Museum, 900 Exposition Boulevard, Los Angeles, CA 90007.

Share the Museum by giving the gift of Membership.
A beautiful gift card will be sent with your personalized message.

Your Name(s) _____ (Please print)

Address _____

City _____ State _____ Zip _____
Day Phone ( ) _____ Evening Phone ( ) _____

☐ Check enclosed (Make payable to Natural History Museum Foundation)
Charge my ☐ American Express ☐ MasterCard ☐ VISA

Account # _____

Signature _____

Recipient's Name(s) _____ (as it should appear on membership card)

Address _____

City _____ State _____ Zip _____
Day Phone ( ) _____ Evening Phone ( ) _____

Please send notice of gift expiration to ☐ Recipient ☐ Me

☐ Family ($35) ☐ Student ($25) ☐ Supporting ($250)
☐ Active ($30) ☐ Contributing ($50) ☐ Sponsoring ($500)
☐ Senior ($25) ☐ Patron ($100) ☐ Fellows ($1000)

Gift Announcement Message _____

_____

Contributions are tax-deductible to the extent provided by law.

YES, I'LL JOIN and support the Natural History Museum.

I want to enjoy the benefits of the membership category checked below:

☐ Family ($35) ☐ Contributing ($50) ☐ Sponsoring ($500)
☐ Active ($30) ☐ Patron ($100) ☐ Fellows ($1000)
☐ Senior ($25) ☐ Supporting ($250)
☐ Student ($25)

This is a ☐ New ☐ Renewal Membership

Names(s) _____ (Please print)

Company _____

Address _____

City _____ State _____ Zip _____
Day Phone ( ) _____ Evening Phone ( ) _____

☐ Check enclosed (Make payable to Natural History Museum Foundation)
Charge my ☐ American Express ☐ MasterCard ☐ VISA

Account # _____ Exp. Date _____

Signature _____

POISON OAK

More than Just Scratching the Surface

by WAYNE P. ARMSTRONG

Photographs by the Author

Poison oak (*Toxicodendron diversilobum*) and its eastern counterpart poison ivy (*T. radicans*) are two of the most notoriously painful plants in North America. Although hundreds of scholarly articles have been written, there are probably more myths about these plants than any other native species. Poison oak and poison ivy do not spare age, sex, race or economic status, and each year thousands of people are afflicted with moderate to severe dermatitis from touching the foliage of these plants. Poison oak and poison ivy account for an estimated 10 percent of lost work time in the U.S. Forest Service; in fact, hundreds of fire fighters who battle summer and fall blazes in California's coastal ranges are so severely affected that they are unable to work. People who breathe in the smoke and soot may develop serious inflammation of respiratory mucous membranes. Because of the serious economic impact due to lost employment time, poison oak "injuries" are covered by workmen's compensation insurance in California.

The first published records of poison ivy in North America date to the early 1600s in the writings of Captain John Smith. In fact, Captain Smith included an illustration of the plant and originated the common name because of its superficial resemblance to English ivy (*Hedera helix*) or Boston ivy (*Parthenocissus tricuspidata*). The name ivy or *hiedra* was also used by early Mexican settlers in California, who mistakenly thought poison oak was a kind of ivy. A little-known subspecies of poison ivy, *T. radicans* ssp. *divaricatum*, is native to southern Baja California and Sonora, Mexico. Our California poison oak was noted by another British explorer of the nineteenth century, Captain Frederick Beechey, who took samples back to England. Much to the chagrin of unwary gardeners, both poison oak and poison ivy were planted in English gardens for their graceful climbing habit and beautiful autumnal coloration.

North Americans and English gardeners are not the only ones exposed by *Toxicodendron* dermatitis. In his monograph of poison oak and poison ivy, William T. Gillis lists four native species of *Toxicodendron* in North America, including seven subspecies of poison ivy (*Rhodora*, vol. 73, 1971). They are remarkably similar in appearance, and some authorities consider our western poison oak to be yet another subspecies of poison ivy (that is, *T radicans* ssp. *diversilobum*). Gillis also lists three species in Malaysia and China, including two subspecies of poison ivy, one in China and one in Japan.

Poison oak is a widespread deciduous shrub that grows throughout mountains and valleys of California, generally below 5,000 feet elevation. In shady canyons and riparian habitats it commonly grows as a climbing vine with aerial (adventitious) roots that adhere to the trunks of oaks and sycamores. Poison oak also forms dense thickets in chaparral and coastal sage scrub, particularly in central and northern California. It regenerates readily after disturbances such as fire and the clearing of land.

The leaves typically have three leaflets (sometimes five), the terminal one on a slender stalk. Poison ivy often has a longer stalk and the leaflet margins tend to be less lobed and serrated (less "oaklike") than poison oak. In the similar-appearing squaw bush (*Rhus trilobata*) the terminal leaflet lacks a stalk. Like many other members of the Sumac family (Anacardiaceae) new foliage and autumn leaves often turn brilliant shades of pink and red due to anthocyanin pigments. In the eastern states poison ivy is often mistaken for another common native called Virginia creeper (*Parthenocissus quinquefolia*). Virginia creeper has a similar growth habit and beautiful autumn foliage, but typically has five leaflets rather than three. It belongs to the Grape family (*Vitaceae*) along with the common wild grape (*Vitis girdiana*).

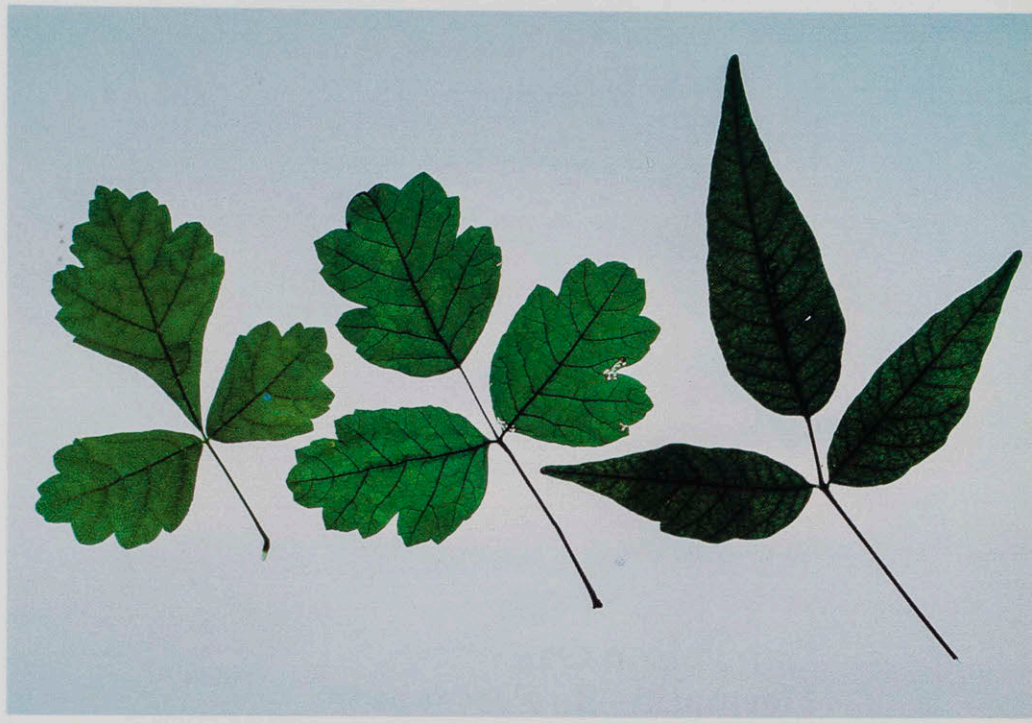
During late spring loose clusters (panicles) of small greenish-white flowers are produced where the leaf stalk joins the stem. Functional male and female flowers are typically produced on separate plants or, occasionally, unisexual and bisexual flowers may occur on the same plant. Male flowers contain five stamens and a rudimentary pistil surrounded by five cream-colored petals and five sepals. Female flowers have a fertile pistil and reduced, sterile stamens. During summer and fall female plants produce small clusters of ivory-white fruits, each with a papery outer exocarp, a soft waxy mesocarp, and a hard stony endocarp surrounding the seed. The fruits of related shrubs such as squaw bush, lemonadeberry (*Rhus integrifolia*), and sugar bush (*Rhus ovata*) are reddish with a sticky-fuzzy exocarp. The old adage about poison oak and poison ivy is quite accurate: "Leaves of three, let it be; berries white, poisonous sight."

Freshly cut stems exude a sticky oleoresin that oxidizes and polymerizes into a shiny black lacquer resembling pruning sealer. The resinous sap is produced in resin canals of the stems, roots, leaves, and flowers. Cross sections of poison oak stems show distinct concentric annual rings. Numerous resin canals appear as tiny black dots and are confined to the phloem layer just inside the bark. [Caution: Cutting and sanding poison oak wood is extremely unwise and hazardous—even if you think you are immune to its dermatitis. This is how I was rudely initiated into the ranks of poison oak sufferers, after tramping through it for decades with impunity!] Dark resin canals (appearing as black striations) also occur in the waxy mesocarp of the fruits just beneath the papery skin. Abundant resin canals is one of the reasons poison oak is now placed in the genus *Toxicodendron* along with poison ivy, poison sumac (*T. vernix*), and the Japanese lacquer tree (*T. vernicifluum*—the commercial source of natural lacquer). In fact, Pomo Indians of California used the natural lacquer of poison oak to dye their baskets. The resin canals also contain urushiol, the insidious allergen that gives poison oak its bad reputation. The name is derived from *kiurushi*, Japanese name for sap of the lacquer tree.

Urushiol is an ill-defined term applied to the toxic substance in the sap causing allergic contact dermatitis in people. It is actually a mixture of phenolic compounds called catechols, potent benzene ring compounds most of which contain a long side-chain of 17 carbon atoms. Urushiol is found in resin canals only—it is on plant surfaces only if leaves and stems are bruised or attacked by chewing/sucking insects. It does not occur in pollen or honey made from poison oak flowers. Although nonvolatile, it may be carried in ash and dust particles and as minute droplets in smoke from burning foliage.

It takes only a molecular trace of urushiol (one billionth of an ounce) on the skin to initiate an allergic reaction. The amount on a pinhead is sufficient to cause rashes in 500 sensitive people. An urushiol residue on the skin is difficult to wash off and may be spread by scratching. Contrary to popular belief, it is not spread through blister fluids. It is a very stable compound and retains its potency for years—herbarium specimens one hundred years old have been known to cause dermatitis. It is readily transferred from contaminated clothing, objects, and fur of animals. To make matters worse, it is fat soluble and readily penetrates the epidermal layer of the skin where it binds to proteins of deeper skin cell membranes. In this state it is virtually impossible to wash off.

In addition to poison oak, poison ivy, and poison sumac, a number of other species in the Sumac family contain urushiol mixtures. In Japan, dermatitis reactions have been reported from contact with lacquered objects (from Japanese lacquer tree) such as bar tops, rifle stocks, and toilet seats. Dermatitis has also been reported in people handling mangoes (*Mangifera indica*), shells of cashew nuts (*Anacardium occidentale*), the Rengas tree (*Gluta renghas*), Burmese lacquer tree (*Melanorrhoea usitata*), and two attractive Caribbean shrubs, *Metopium toxiferum*



*Poison oak, center, is often mistaken for squaw bush (*Rhus trilobata, *left), which does not cause allergy reactions. A little-known subspecies of eastern poison ivy is* Toxicodendron radicans *ssp.* divaricatum, *right, a native of Baja California and Sonora, Mexico.*

*Left: A climbing branch of poison oak (*Toxicodendron diversilobum*) showing the leaf divided into three leaflets and the adventitious (aerial) roots. In shady canyons and along waterways poison oak commonly grows as a climbing vine. Much to the chagrin of unwary gardeners, both poison oak and poison ivy were planted in English gardens for their graceful climbing habit and beautiful autumnal coloration.*

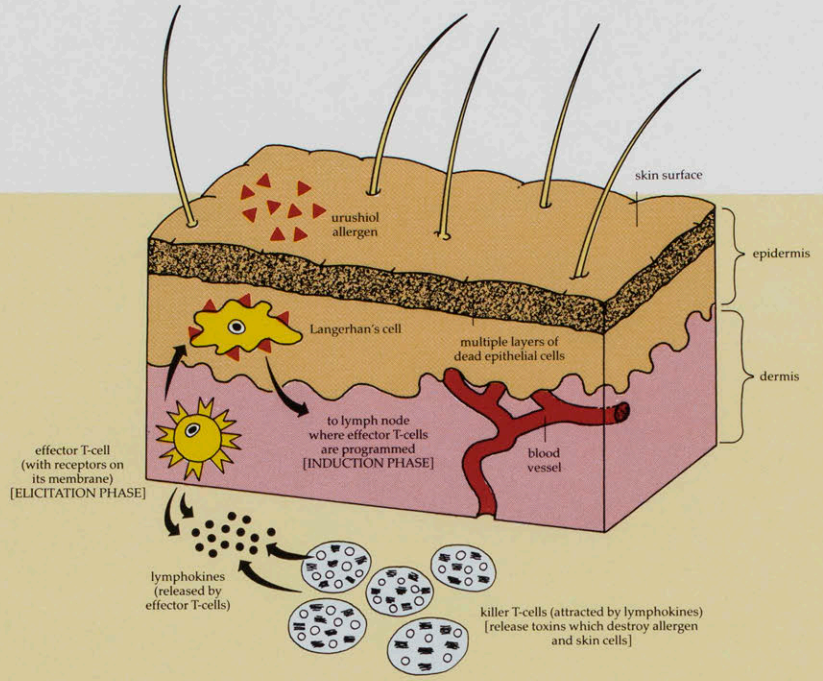

skin surface
urushiol allergen
epidermis
Langerhan's cell
multiple layers of dead epithelial cells
dermis
to lymph node where effector T-cells are programmed [INDUCTION PHASE]
blood vessel
effector T-cell (with receptors on its membrane) [ELICITATION PHASE]
lymphokines (released by effector T-cells)
killer T-cells (attracted by lymphokines) [release toxins which destroy allergen and skin cells]

Illustration showing hypothetical mechanism of poison oak scenario—a cell-mediated immune response.

Can Poison Oak Dermatitis Be Prevented?

The list of treatments for poison oak is bewildering and in some cases preposterous. Just about every conceivable substance has been tried for topical therapy, from morphine and kerosene to buttermilk and gunpowder! Most authorities agree that lotions, creams, and sprays containing anti-inflammatory corticosteroids (hydrocortisones) are the most effective agents to relieve painful, itching rashes. Serious outbreaks may require medical attention and hospitalization. Ideally the best therapy when exposed to poison oak is to wash the contaminated areas thoroughly. The problem is that most ordinary bath soaps have little effect on removing the resinous sap. Have you ever tried removing pine pitch from your arm with facial soap? In fact, added moisturizers and oils in the soap together with brisk rubbing may even spread the urushiol, increasing the area of allergic response. Strong laundry soaps, such as Fels Naptha, may also spread the allergen and be harsh on sensitive skin. Some books still recommend antipruritic (anti-itch) agents such as calamine lotion for mild cases. A poultice made from the resinous flowers and leaves of gum plant (*Grindelia robusta*) was commonly used by Indians and early settlers in California to relieve inflammation and itching.

A product called Tecnu Oak-N-Ivy Cleanser is now marketed through forestry supply catalogs. It contains a mixture of organic solvents and wood pulp by-products that remove terpene resins and urushiol from the skin. Thorough rinsing under hot water is recommended. Other organic solvents, such as rubbing alcohol, would probably also remove the urushiol residue. Of course, if the allergen has already penetrated the epidermal layer and bonded to deeper skin cells, it is too late. Interestingly enough, the original Tecnu product was developed to remove radioactive fallout dust from the skin without water. It was supposed to be stocked in fallout shelters across the United States. Later it was found to be highly effective in removing paint resins and, quite by accident, urushiol.

Another product developed for the U.S. Forestry Service is called Ivy-Block. It is an aerosol spray containing activated bentonite clay used in antiperspirants. Ivy-Block forms a barrier that both prevents urushiol from touching the skin and chemically binds with it so it becomes inactive. According to Dr. William Epstein, Ivy-Block is very effective, but may not prevent a reaction in extremely sensitive people. At the present time it is not available pending FDA approval.

and *Comocladia dodonaea*. The name Rengas actually refers to several genera of large Malaysian trees with resinous sap that blackens when exposed to the air. The heartwood is dark red-brown with a beautiful grain, but it is dangerous to work. Were it not for this drawback, Rengas timber would be one of the finest decorative hardwoods. Imported Haitian voodoo dolls and swizzle sticks made from cashew nuts have produced dermatitis reactions similar to poison oak. Laundry markings made from the India marking nut tree (*Semecarpus anacardium*) have caused neck irritation and rashes, even after the clothing was repeatedly washed. Urushiols also occur in the seeds of *Ginkgo biloba* (Ginkgoaceae) and in several genera of the Proteaceae.

Poison oak urushiol causes a complicated delayed allergic reaction with the body's immune system. It is technically classified as a cell-mediated immune response, and the "peak misery" of the reaction may not appear until days or weeks later. It is quite different from the primary irritants of nettle and euphorbias, the effects of which are immediate. The following "two-phase" scenario for poison oak dermatitis is summarized from William L. Epstein (*Current Perspectives in Immunodermatology*, 1984).

Phase I (Induction): Initial contact with poison oak *may* result in urushiol penetrating the stratified squamous epithelial cells of the skin and binding to a large dendritic (branched) white blood cell deep in the epidermis called a Langerhan's cell. The Langerhan's cell (with urushiol on its membrane) migrates to a nearby lymph node where special white blood cells, called effector T-cells, are programmed to recognize urushiol. There are literally billions of effector T-cells roaming throughout the blood and lymphatic system, each with special receptor molecules on their membranes for a particular allergenic chemical, such as the urushiol of poison oak. T-cells patrol your circulatory system for invading cells and viruses, inspecting surface membranes like security guards checking I.D. cards.

Phase II (Elicitation): If you get urushiol absorbed into the skin during a subsequent encounter with poison oak, an effector T-cell *may* encounter it and attach to it. The effector T-cell then produces more clones of itself and releases special proteins called lymphokines, which attract a legion of different white blood cells, including macrophages and cytotoxic

"Leaves of three,
let it be;
berries white,
poisonous sight."

("killer") T-cells. The new army of white blood cells releases toxins that destroy the urushiol and skin cells, thus producing a blistering rash. Lymphatic fluids ooze from the swelling and breakdown of skin tissue. Milder effects may range from redness and itching to small blisters.

Explanations for natural immunity to poison oak are complicated by myths, conflicting reports, and ongoing controversies among authorities. Sensitization depends on the chance meeting of a special effector T-cell (with correct receptor site) and the poison oak allergen—a painful biochemical rendezvous. You may not have effector T-cells with special receptor for urushiol—or perhaps your relatively few effector T-cells with precise poison oak receptor may never encounter the urushiol allergen. The allergen may be absorbed and degraded before the T-cells find it. If the truth is known, most people will probably experience some degree of dermatitis if a sufficient quantity of urushiol is thoroughly rubbed into their skin. You may even be sensitized by a white blood cell transfusion from a sensitized person. Immunity to poison oak with age, exposure, and homeopathic remedies may involve suppressor T-cells that inhibit or block the action and reproduction of other T-cells. According to Dr. William L. Epstein, Professor of Dermatology at the University of California School of Medicine in San Francisco (personal communication, 1988), circulating immune-type antibodies may also be involved.

Since the Human Immunodeficiency Virus (HIV) attacks T-cells, persons afflicted with the deadly disease AIDS have a serious defect in cellular (T-cell) immunity. According to Dr. Epstein, AIDS patients may not have problems with poison oak dermatitis and this probably reflects their decreased cellular immunity. In fact, one treatment for AIDS patients is to try to sensitize them to another allergenic chemical (dinitrochlorobenzene) in order to stimulate T-cell production.

During the last century scientists have tried all sorts of homeopathic remedies made from extracts of poison oak. Some products, such as poison oak tablets and droplets, have been withdrawn from the market because of severe allergic reactions in hypersensitive people. According to Dr. Epstein the side effects in some people, such as severe anal itching, were often unbearable. One promising area of desensitiza-

Poison oak fruits. Those on the right have had their outer covering removed, exposing the inner layer striated with black resin canals. The resin canals contain urushiol, the allergen that gives poison oak its bad reputation, and they occur in the plant's leaves, stems, flowers, and fruit.

Male flower cluster of poison oak. Urushiol does not occur in pollen or honey made from poison oak flowers.

tion research involves oral pills and intramuscular injections of related or modified urushiol: a molecule similar enough to urushiol to have the same immunological effect, but different enough to avert its excruciating side effects. Several compounds have been used successfuly with laboratory animals. Future research may lead to a vaccine that will immunize high risk people against urushiol by the production of antibodies.

It is difficult to explain how California Indians used poison oak so extensively without suffering the ill-effects of urushiol. Perhaps some may have acquired an immunity from early exposure to the plant, or perhaps they handled the plant very cautiously. In addition to using poison oak lacquer as a black dye, Pomo Indians also used it to cure warts. The wart was incised and then fresh resin was applied to the incision. Fresh resin was also used as a cure for ringworm and was applied to rattlesnake bites. Several tribes used the young flexible stems to weave baskets, although squaw bush branches were more commonly used. Karok Indians of northwestern California covered the bulbs of soap lilies (*Chlorogalum pomeridianum*) with poison oak leaves and then baked them in earth ovens for food. Other northern California tribes wrapped acorn meal with poison oak leaves during baking.

According to Albert M. Kligman's classic paper on poison oak (*Archives of Dermatology*, vol. 77, 1958) there is no evidence of racial immunity to poison oak urushiol, not even among full-blooded Native Americans; however, Black skin is slightly less susceptible. Native Indians probably learned to recognize, respect, and avoid the plant at an early age. There is some evidence suggesting that native-born Hawaiians and Orientals may be less susceptible to poison oak due to early exposure to mangoes and Japanese lacquer.

The evolutionary significance of poison oak resin containing urushiol is difficult to explain. The resinous sap probably helps to seal wounds and may retard the growth of infectious fungal and bacterial spores. A chemical defense strategy against predatory pressure seems unlikely since the foliage and fruits are eaten by deer, goats, horses, cattle, and a variety of birds. In fact, wood rats even use the branches in constructing their nests. Only humans appear to have painful encounters with the plant, although laboratory studies indicate sensitivity on exposed skin of guinea pigs, rabbits, mice, sheep, dogs, and rhesus monkeys.

In the case of humans, our well-developed immune system may be overreacting to a relatively innocuous plant resin on the skin. But there is a positive side to all of this—research on poison oak may lead to a better understanding of the human immune system and the treatment of renegade viruses and tumor cells. In the final analysis, poison oak may be a blessing in disguise.

A chaparral fire in southern California. Smoke and soot from burning poison oak foliage may contain microdroplets of urushiol, and people who breathe it may develop serious lung inflammation. Hundreds of fire fighters who battle summer and fall blazes in California are so severely affected by poison oak that they are unable to work.

Wayne P. Armstrong is Professor of Biology at Palomar College in San Diego County. He has written for Pacific Discovery, Madrono, Environment Southwest, *and* Fremontia *as well as* TERRA. *His research interest is the taxonomy of the Lemnaceae (duckweed) family.*

The Paddison Farm

A Rural Oasis in Sprawling Suburbia

by TOM SITTON

Photographs by DICK MEIER

A rural California road? No, it's the Paddison Ranch in Norwalk, just 13 miles (as the crow flies) southeast of downtown Los Angeles. This farm is a reminder of what was once one of the nation's most productive agricultural regions, now built over by housing tracts and commercial structures.

The Paddison farmhouse in 1989. The relatively simple Victorian structure is ornamented by Eastlake stickwork, dropped pendants, and decorative window trim. It has changed little since its construction in 1879.

The process of urbanization and suburbanization in Los Angeles County over the last century has transformed one of the nation's most productive agricultural counties into a sprawling region overrun with housing tracts, apartment buildings, and commercial structures. With improved interurban transportation, real estate promotions, and tidal waves of immigrants, the rural landscape of the county has gradually changed into mile upon mile of dwellings and business blocks broken only by occasional hills and farmland coveted by developers.

This is particularly true for the southern portion of Los Angeles County, where suburbs have swallowed most of the available land in the twentieth century. But a few anachronistic parcels remain. In the city of Norwalk a six-acre portion of a nineteenth-century farm still exists in a condition reminiscent of its past glory. Tucked into a niche between a shopping center and housing tract, and hidden from busy Imperial Highway by a wall of eucalyptus and other trees, the Paddison Farm so far has survived the onslaught of development.

The farm was established by John Paddison, one of Norwalk's early pioneers. Born in Wales in 1845, Paddison immigrated to the United States in 1869 and settled on the present site of the farm a decade later. Although a man of limited means, he purchased 46 acres and began farming alfalfa and pasturing. As soon as he settled, Paddison started construction of a Victorian farmhouse and outbuildings. Successful in his farming endeavors, his operation expanded to about 276 acres and by the turn of the century included dairy farming.

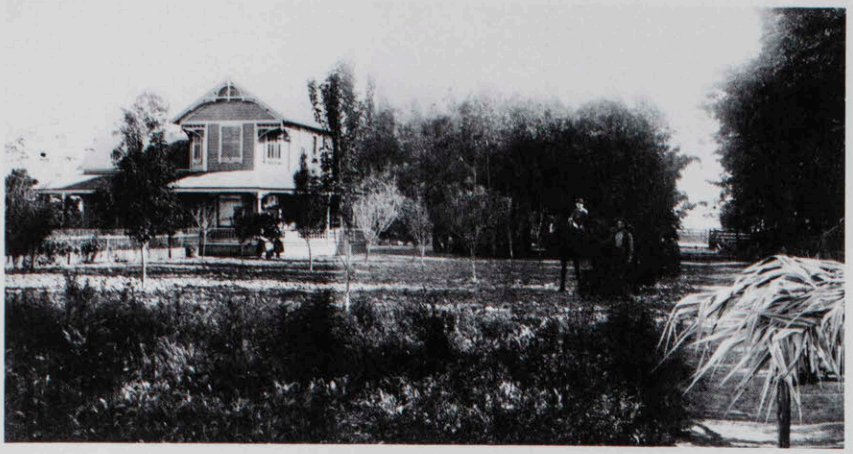
Following John Paddison's death in 1926, the farm was taken over by his son Edward, who continued its operation and took exceptional care of the buildings. As the Norwalk area expanded in population, increasing land values for residential and commercial property forced Edward to sell off most of the farmland except for the original homesite. Upon his death in the early 1970s, the remaining six-acre complex was inherited by his grandson, who owns it today.

In the 1930s the Paddison Farm became the location for the filming of *Christopher Bean*, a motion picture starring Marie Dressler and Lionel Barrymore. Since then, scenes of other movies and quite a few commercials have been filmed at the farm—for obvious reasons. Though compact, the farm reflects the ambiance of rural life in southern California of a century ago. Surrounded by walls, trees, and tall corn stalks, the farm contains numerous buildings and farming implements, which make it a popular site for filming and tours for local school children.

The focal point of the farm is a two-story frame house in simple Victorian styling. A porch supported by turned posts begins at the main entrance and stretches around the eastern side of the structure. The gabled second story is ornamented by Eastlake stickwork, dropped pendants, and decorative window trim. The interior contains high ceilings and redwood paneling with an assortment of family antiques. Other than the enclosure of the western half of the front porch in the 1920s and the addition of a kitchen in the rear, the farmhouse has changed little since its construction in 1879.

Behind the farmhouse is a complex of support buildings. Of special interest is a redwood barn built about 1900, which includes horse stalls and a mass of old furniture and household goods. Recent commercial use of the property has brought about a few changes. In 1975, a Depression Era advertisement for a Chevrolet was painted on the barn entrance, a fitting announcement for the 1936 Chevy truck housed within. A few years ago most of the barn's contents were temporarily removed when the rock group Foreigner shot a video there.

Across from the barn is a long, low blacksmith shop with a sagging roof. Inside, a mass of tools, forges, agricultural implements, and other objects line the walls and occupy most of the available space within this structure, giving it the appearance of a well-stocked farm blacksmith shop of about



The Paddison Ranch in 1891—before the intrusion of housing developments, mini-malls, and apartment complexes. A farmhand stands with the son of the farm's founder, John Paddison. The elder Paddison came to the United States from Wales in 1869 and settled in Norwalk in 1879.

1920. Outside the enclosure, another 1936 flatbed truck is almost covered with more farm equipment.

Other rural structures—chicken coops, a washhouse, a water well, corn cribs, the all-important outhouse, as well as a more modern garage and additional smaller farmhouses—are located on the property. Besides the buildings, the site includes old horse-drawn farm equipment, Norwalk's first commercial gasoline pump, and the mandatory white picket fence in the front of the homestead. The property is "guarded" by two fierce canines, protectors of the farm's chickens, ducks, and roving band of peacocks.

Until just a few years ago, the farm claimed to have the oldest and largest standing barn in southern California. A fire destroyed most of this remarkably preserved structure, and the ruins of the barn finally had to be removed.

In 1977, the Paddison Farm was included in a cultural resource survey of more than 500 Los Angeles County historic sites conducted by the staff of the Natural History Museum. Because of its historic significance and precarious financial situation at the time, the farm was also nominated for the National Register of Historic Places. Inclusion in the National Register provides a minimal amount of protection for sites facing demolition or radical alteration and also qualifies the resource for various tax and restoration benefits when funds are available.

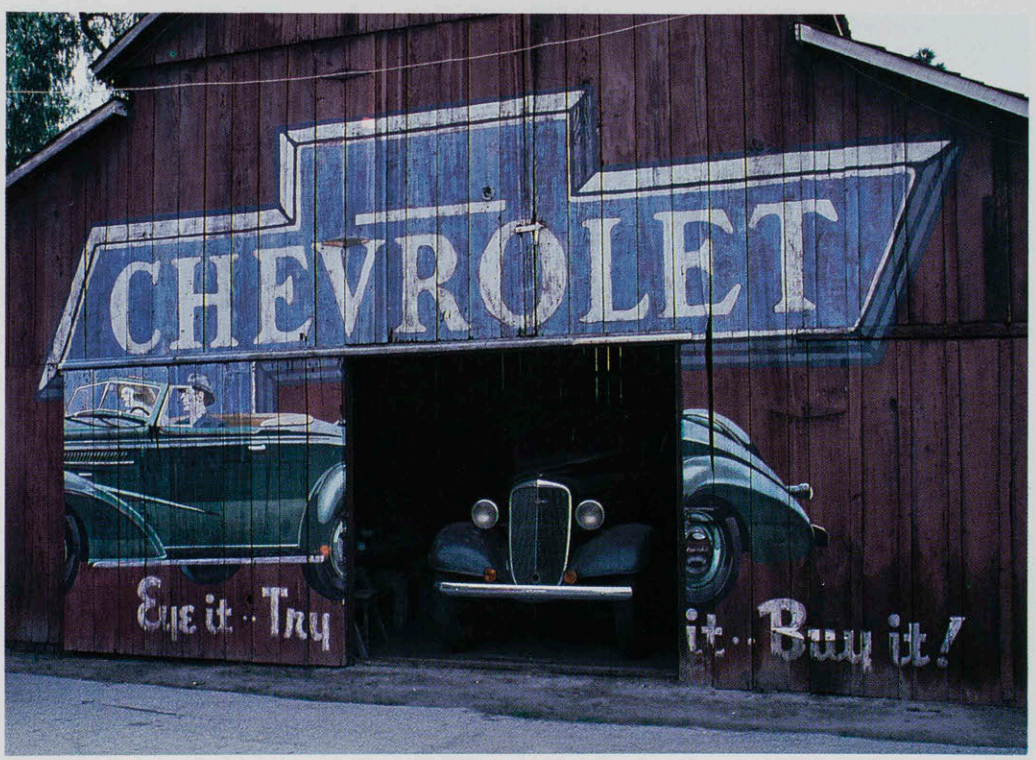
The farm was listed on the National Register in 1978, and its owners claim that this status probably saved the complex from extinction when planning began for a major redevelopment of the area a few years later. The site now faces another threat to its historical integrity in the form of a massive building project being considered for the property next door.

At this writing, the Paddison Farm is still intact and is becoming a more valuable resource to city officials. Plans to sell the farm—lock, stock, and peacocks—to the city of Norwalk to be operated as a living museum have been considered, though funds are not available. For the present, owners Robert and Margaret Scantlebury hope to stage social events on the grounds to finance the upkeep of the buildings.

Although the farm's soil never will be tilled as it was a century ago, at least the buildings and artifacts that supported that endeavor are being preserved as a reminder of life before suburbia. With continued efforts on the part of its owners, the Paddison Farm will remain one of the most significant cultural resources in the Los Angeles area and an extraordinary relic of the agricultural heyday of Los Angeles County.

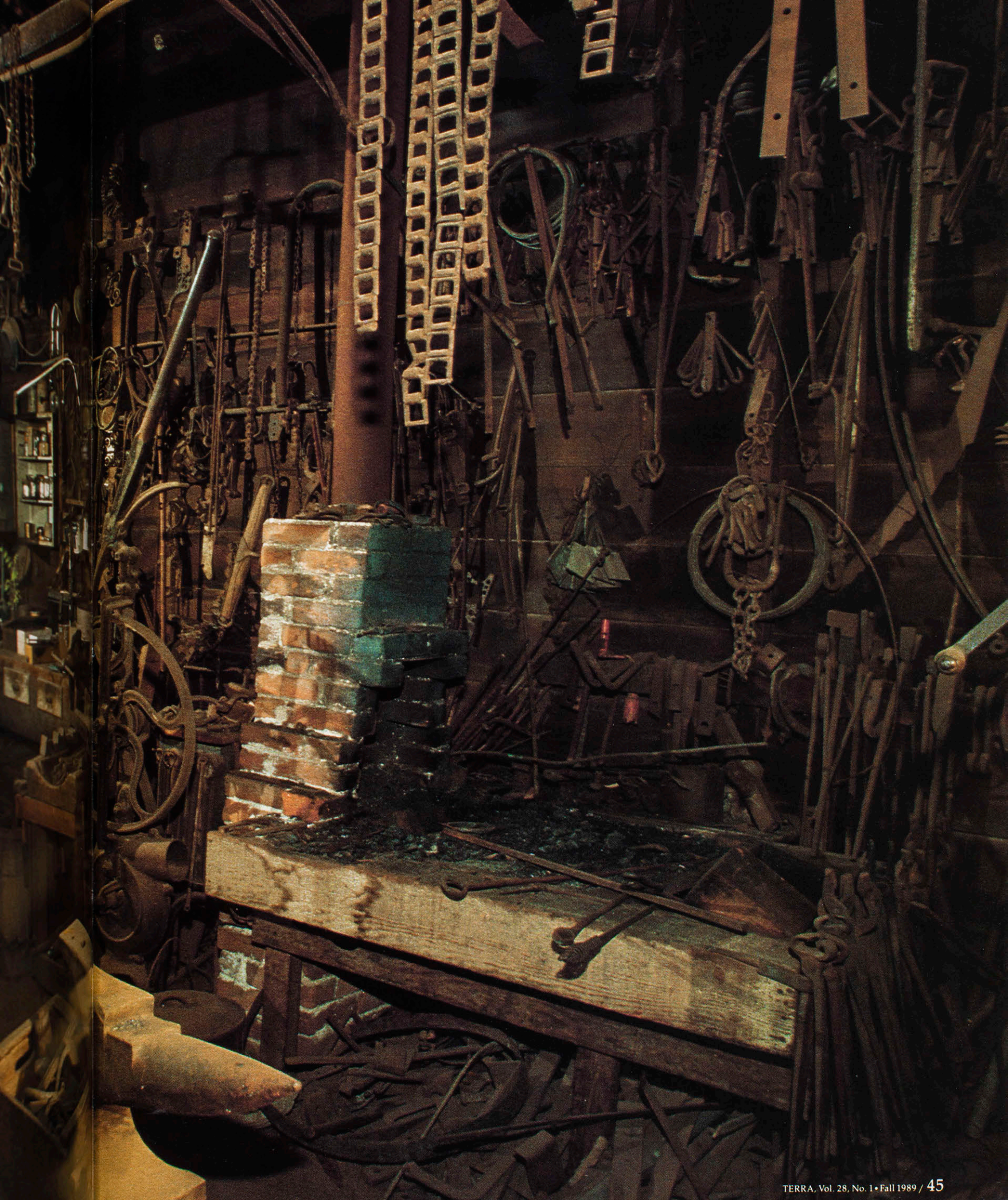
The Paddison Farm is a private residence and is not open to the general public. However, private tours can be arranged by calling (213) 864-1407.

Tom Sitton is an Assistant Curator in the museum's General Americana Section and is responsible for surveying historic sites in Los Angeles County.

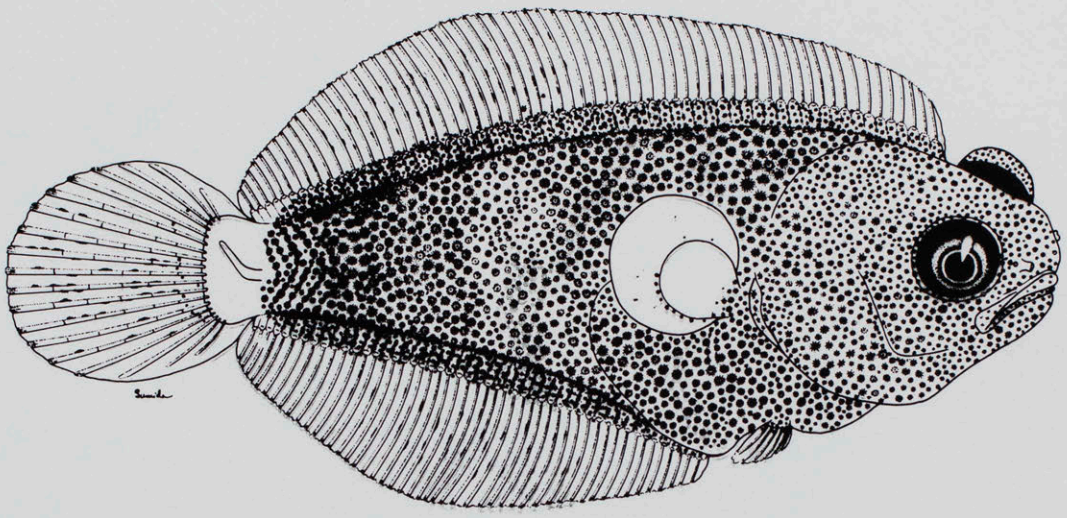


The ranch's redwood barn was built in 1900; the Depression Era advertisement, however, was painted in 1975 for a Chevrolet commercial. Housed in the barn is a 1936 Chevy flatbed truck with only 50,000 miles on its odometer.

Tools, forges, and agricultural implements line the walls of the ranch's 1920s-era blacksmith shop.



Continued from page 5



U.S. Department of Commerce, *Fishery Bulletin*, January 1979

The museum has recently received a National Science Foundation grant to strengthen its larval fish holdings, which include such specimens as this spotted turbot (Pleuronichthys ritteri). *The turbot's left eye is beginning its migration to the fish's right side.*

TWO NEW MUSEUM TRUSTEES NAMED. Edward M. Carson, president and director of First Interstate Bancorp, has been named to the Board of Trustees of the Natural History Museum of Los Angeles County.

Mr. Carson, former president and chief executive officer of First Interstate Bank of Arizona, is an Arizona native. He joined First Interstate Bank in 1951 after graduating from Arizona State University and spent his entire banking career with that institution.

Mr. Carson is active in many civic and professional organizations and is a member of the board of fellows of the American Graduate School of International Management, a life board member of the Fiesta Bowl, and is on the advisory board of the Boy Scouts of America, Los Angeles Council. He is also a director of Inspiration Resources Corporation and First Interstate Banks of Oregon, Texas, and Denver.

Dr. Patricia House, noted clinical psychologist, has been named to the museum's Board of Trustees. A member of the museum's Alliance Board since 1985, Dr. House left private practice four years ago to pursue volunteer work. She has served as chairperson of the museum's Fellows Program since 1986 and lists among her volunteer efforts the House Ear Institute, the Music Center Associates Guild, the Philharmonic Association, and Las Floristas.

A resident of San Marino, Dr. House is a member of the San Marino Schools Foundation, where she initiated science programs in the San Marino elementary schools that included science labs and volunteer teachers. Her current volunteer efforts also include the supervision of three psychologists.

Dr. House is the mother of three children. She holds a Doctorate in Psychology from Sussex College, England, and obtained a Masters in Business from the University of Southern California.

RESEARCH NEWS

NATIONAL SCIENCE FOUNDATION GRANT FOR LACM LARVAL FISH PROGRAM. The museum's Section of Fishes was awarded a grant in the amount of $177,096 by the Biological Resources Program of the National Science Foundation (NSF) to organize and to strengthen the museum's larval fish holdings. The three-year award is to Robert J. Lavenberg, principal investigator, and Gerald E. McGowen, project director.

Even though knowledge about the pre-adult stages of fishes is essential for understanding many aspects of fish biology, this component of their life history is neither well studied nor are specimens saved in most museum collections.

The primary goal of the program is to establish a major West Coast repository for early life-history stages of fishes at the Natural History Museum. With this support the Section of Fishes will continue to seek important collections of young stages of fishes in support of ichthyological research. In addition, this grant provides limited funding for partial support of visiting specialists, to whom the museum will provide its facilities and collections.

The museum received its first significant collections of larval fishes in the early 1970s, and larval fish holdings have been substantially improved during the 1980s. Currently, the collection consists of some 28,000 lots of eggs, larvae, and juveniles, plus about 4,500 unsorted plankton samples, which amounts to nearly 3 million eggs, 1.2 million larvae, and 3,700 juveniles—representing about 700 species. Major geographical holdings center on southern California coastal waters, but the eastern Pacific from Chile to the Gulf of Alaska is represented, including small but important collections from the Galápagos Islands, Costa Rica, Gulf of California, and the west coast of Baja California. Other important larval collections include miscellaneous species from Antarctic waters, collected by the Research Vessel *Eltanin*, lanternfish and mackerel larvae from the Indian Ocean, and a few lots from the Bahamas, off Georgia, Gulf of Mexico, Bering Sea, Hawaii, Line Islands, and the Tasman Sea-New Zealand. Although the strength of the collection is in marine fishes, it does contain a small but taxonomically diverse collection of larvae and early juveniles from estuarine and freshwater habitats of the Rio Orinoco drainage of Venezuela.

The importance of the larval fish holdings was recognized in 1988 and strengthened considerably when Dr. Bruce Robison donated 181 lots of about 16,000 larval and juvenile fishes from the Timor, Banda, Halmahera, Molucca, Celebes, and Sulu Seas taken by the *Alpha Helix* Southwest Asia Bioluminescence Expedition during March–June 1975.

AWARDS

HISTORY CURATOR RECEIVES LITERARY AWARD. The Carl I. Wheat Memorial Award was presented to William M. Mason, curator of history, in a recent ceremony at El Alisal, the headquarters of the Historical Society of Southern California. The Wheat Award is given to an "author who contributes an outstanding article of significant historical and high literary quality" to the *Southern California Quarterly*. Mason was honored for his article, "Adobe Interiors in Spanish California," which appeared in

the Fall 1988 edition of the *Quarterly*, a scholarly journal containing articles and edited documents relating to the history of the Far West, with special emphasis on California and its neighboring regions.

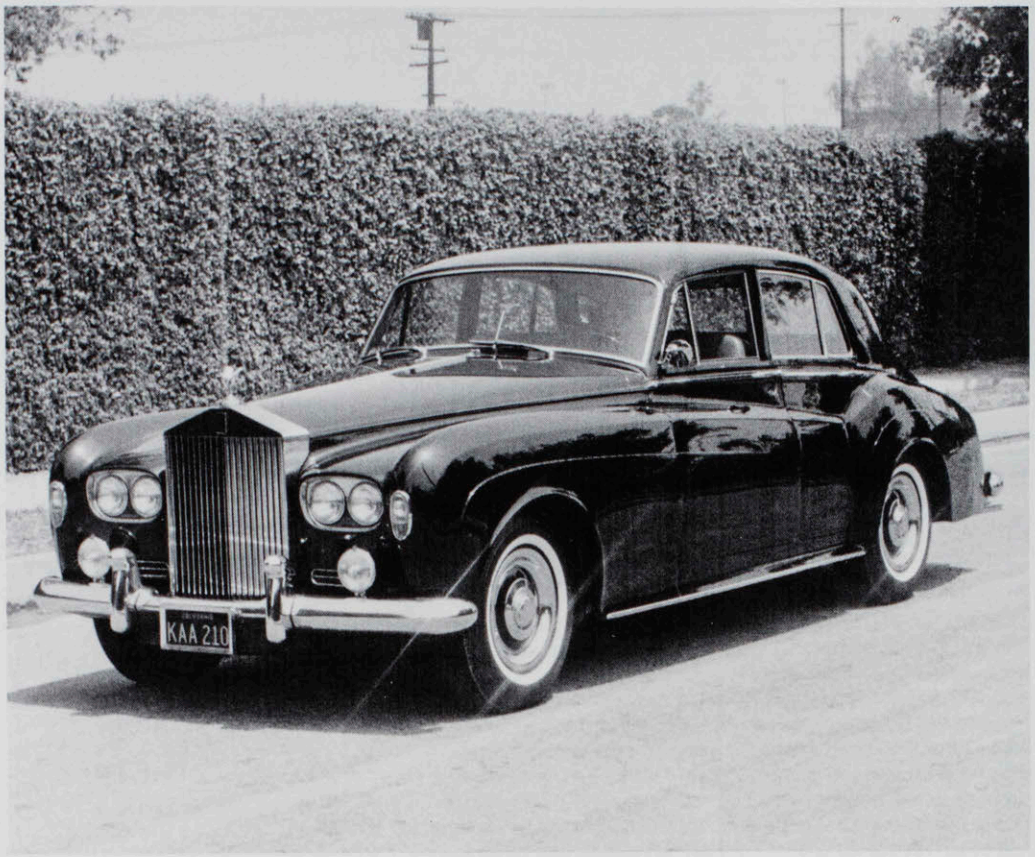
The ceremonies included presentation of the Award of Merit to Mason "in recognition of (his) distinguished contribution and service to the history of Southern California" and an honorarium of $300.

The Historical Society of Southern California, which was founded in 1883, was itself one of the founders of the Natural History Museum. Carl I. Wheat (1892-1966) was an important California bibliographer, editor, and historian whose five-volume book, *Mapping the Transmississippi West* is the standard reference on Western exploration and maps.

Mason's "Adobe Interiors in Spanish California" addresses the subject of California domestic furnishings and design between 1790 and 1822. Sources for the study included a great variety of documentation: personal reminiscences, mission account books, wills and other legal documents, travelers' accounts, ships' manifests, cargo lists, and mercantile inventories. The profusely illustrated "Adobe Interiors" is part of a larger study that engages Mason at the present time.

NEW ACQUISITION

1963 ROLLS ROYCE SILVER CLOUD III. The museum's automobile collection continues to grow with the recent acquisition of a 1963 Rolls Royce Silver Cloud III. This contemporary classic adds scope to the museum's unique automobile collection, which includes seventy-five vehicles and represents the largest resource of its type maintained by a public institution on the West Coast. The Rolls—known fondly to the donors, J. Ellis and Maurine Dion of Pasadena, as "Sir Costalot"—was a consistent concours d'élégance winner despite the fact that it saw daily service (vehicles competing in a concours d'élégance are judged by their appearance and elegance rather than their roadworthiness).



This 1963 Rolls Royce Silver Cloud III has recently been donated to the museum.

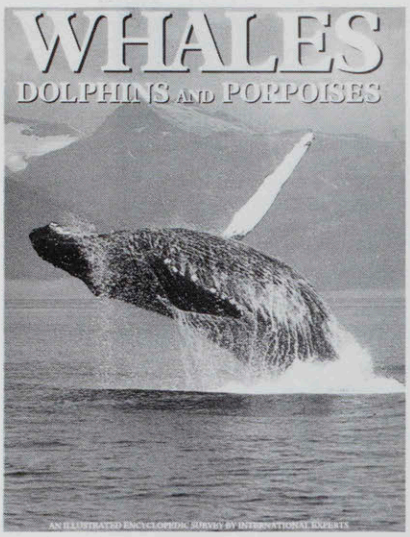
GRANTS

MURAL RESTORATION GRANT. The museum's Earth Sciences Division and Registrar's Office have obtained a matching grant from the Institute of Museum Studies for $25,000 toward the cost of restoring the famed Rancho La Brea Mural by Charles R. Knight (1874-1953). Knight was the first artist to imbue prehistoric animals with dynamic realism. His Rancho La Brea mural, which recreates a scene at the Los Angeles "Tar Pits" toward the end of the last Ice Age, has been extensively reproduced in text books. Commissioned in 1925, the mural remained on display at the Natural History Museum until August of this year and has brought fossils to life for untold numbers of Los Angeles residents and visitors. The IMS grant will provide funds toward the mural's much needed restoration, and the Natural History Museum Foundation will be seeking the balance needed to conserve Knight's masterpiece for the benefit of future generations. If you are interested in helping fund the mural's restoration, please contact the Development Office, Natural History Museum, 900 Exposition Boulevard, Los Angeles, CA 90007; 213/744-3307.

Errata. Katsumi Kunitsugu, Executive Secretary of the Japanese American Cultural and Community Center, pointed out that David Gonzales was not the only Los Angeles winner of the Army Medal of Honor in World War II. Private First Class Sadao Munemori, a Cypress native and a member of the famed 442nd Regimental Combat Team (the most decorated unit of its size in the history of the U.S. armed services) also received the honor. Pfc. Munemori sacrificed his life for his fellow soldiers on the Italian front, throwing himself on a grenade to shield them before it exploded.

The gift of the Dan Murphy Foundation, reported in the Summer 1989 "Museum on the Move" column, supports the Ralph W. Schreiber Hall of Birds.

BOOK REVIEWS



WHALES, DOLPHINS, and PORPOISES
by R. Harrison and M. Bryden
Facts on File, 1988, $35 (Cloth).

In the past decade a plethora of books have appeared dealing with marine mammals. Some are like tremendously detailed textbooks and others are coffee-table books filled with spectacular photographs. This book is a well conceived blend of both: each page is richly filled with either illustrations or superb photographs, and the text is written primarily by a cosmopolitan array of scientists. One of the authors for two of the chapters is the museum's own Curator of Vertebrate Paleontology, Dr. Larry Barnes.

The book is subdivided into three sections, each containing five or six chapters. The first section is titled *Whales of the World*. The first chapter chronicles the evolution of whales, dolphins, and porpoises (cetaceans) from their terrestrial beginnings as carnivorous hoofed-mammals to their modern forms. The next three chapters cover the diversity of living whales including a synopsis of all the families of cetaceans. The last chapters provide an overview of cetacean ecology and distribution. Included here are interesting ideas regarding the way habitat may influence dolphin social systems.

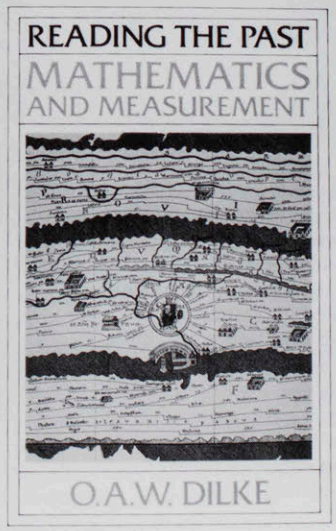
The middle third of this book evaluates the world of the whale. The first two chapters discuss the anatomical and physiological adaptations of these fascinating creatures to the world's oceans. Insight is provided as to how they eat, sleep, and reproduce without ever coming ashore. Perhaps most interesting is the lucidly written section that explains our understanding of how a species like the sperm whale can hold its breath for over an hour while diving a thousand feet or more below the surface, and not suffer such maladies as the "bends." The next chapter reviews how cetaceans use their senses to perceive their aquatic realm. The final two chapters present our growing understanding of whale and dolphin social behavior and discuss the often-touted intelligence of these animals. These two chapters cover much of the material most frequently asked about by the public.

The last section of the book, "Whales and Man," synthesizes many aspects of the relationship between cetaceans and humans. This relationship encompasses the benign use of the leviathan and allies in novels, mythology, and art. More invasive contacts are discussed in chapters involving encounters in the wild and dolphins in captivity. Also presented is the methodical hunt of whales from aboriginal catches to modern whaling using highly mechanized factory ships, an activity that almost caused the extinction of many species. The book finishes with a discussion of cetacean strandings, in particular the stranding of live animals.

Because this book was written primarily by scientists, it provides details and insights not present in most general books on cetaceans; however, minor technical errors did slip through. Sperm whales and river dolphins are classified somewhat differently in Chapter 1 than elsewhere in the book. This reflects a legitimate scientific disagreement, but because this is not discussed, it may confuse the careful reader. My only strong criticism is that in the last chapter on strandings, the authors present there own theory regarding the cause of live strandings as fact. This theory suggests that anomalies in the Earth's magnetic field disorient cetaceans, which use this field for navigation. While this idea is intriguing, it is far from being conclusively proven. The photographs in the book are breath-taking, but the illustrations are only mediocre; regrettable with several very talented marine mammal illustrators around. In spite of some minor quibbles I have mentioned, this book offers a tremendous amount of readable information and should be a must for those interested in these splendid mammals.

John E. Heyning
Assistant Curator of Mammals

■



MATHEMATICS AND MEASUREMENT
by O.A.W. Dilke.
University of California Press, 1987, $7.95.

If you are put off by mathematics, as many people are, let me put your mind at ease. You don't have to like math to enjoy this book. It is readable, brief, and interesting.

The ancients used a wide range of mathematics with great accuracy. They traced the stars, used weights, and measures, kept time, built roads, surveyed land, and even came up with a pyramid or two. The ancient Egyptian calendar consisted of twelve thirty-day months, with five days added. The days, like ours, were divided into twenty-four hours. Their Nilometer kept track of the rise and fall of the river, and after each yearly inundation the land was resurveyed so that crops could be planted. According to the Rhind mathematical papyrus, they knew the right triangle and used a *pi* of 3.1604938. While their numbers weren't always exact, they still managed to build some very impressive and long-lasting monuments.

The Greeks and the Romans used a zodiac of twelve signs, each consisting of thirty degrees. They used letters as numbers, and that system is still used from time to time. While the Greeks had no zero in regular use, they seem to have used one in astronomy.

The Greeks considered the study of mathematics essential to a complete education, but the Romans only saw its importance in technology. In 531 B.C., Pythagorus of Samos moved to Croton in South Italy and established a community of mathematicians and mystics. A sign on Plato's door read, "No one ungeometrical may enter." Archimedes (287-211 B.C.) calculated that silver, if substituted for gold, would require more of the metal to make up the weight, and proved his theory on an unfortunate goldsmith who tried to cheat when he made a ruler's crown. Archimedes ran home crying, "Eureka!" What the unlucky goldsmith shouted, we can only guess.

A cubit, the length of a forearm, was 49.5 centimeters in Sumer and 52.3 centimeters in Egypt. "Inch" comes from Old English *ynch*, which in turn is from Latin *unus*, or a twelfth. A mile comes from Latin *mille passus*, and measured 1.4785 km.

The book contains many intriguing facts and includes an excellent bibliography for those who want to go further. And you don't have to work even one story problem!

Jay Bisno
Curatorial Assistant
Anthropology Section

MUSEUM TRAVEL PROGRAM

© Sven-Olof Lindblad

Travelers to Baja California meet a friendly gray whale at San Ignacio Lagoon.

Christmas in Santa Fe
December 23–30, 1989
The cultural heritage of Santa Fe — Indian, Spanish, Anglo — is visible in the art, architecture, food, crafts, and daily life of its people. Visit the studios, galleries and museums of Santa Fe, as well as nearby Indian pueblos and archaeological sites.
$1,608 including airfare

Mexico Monarch Butterfly Safari
January 13–17, 1990
Join us on an extraordinary safari to witness millions of monarch butterflies overwintering in the mountains west of Mexico City — remote sites where virtually the entire population of monarchs from Eastern North America congregates for the winter. Opportunities to visit the National Museum of Anthropology, Ballet Folklorico, and Templo Mayor in Mexico City are included.
$790, plus airfare ($317)

Project Antarctica
January 15–29, 1990
Experience the highlight of a lifetime — the ice-sculpted beauty of Antarctica's remote continent — as you visit blue-hued glaciers, islands teeming with penguins and seals, and breathtaking fjords on a luxury adventure cruise aboard the *World Discoverer.*
From $5,310, plus airfare

Baja California and the Sea of Cortez
February 10–17, 1990
Explore the natural history of Baja California — including Laguna San Ignacio and Bahia Magdalena, where the California gray whales come to give birth and nurture their young — aboard the 74-passenger *Sea Lion.* Small boats will take you ashore to view the plants, birds, animals, and geology of this pristine desert.
From $1,790 including airfare

Yellowstone in Winter
March 6–11, 1990
Experience the beauty of winter in the world's first national park. Traveling by snow coach and sleigh, view the moose, bison, Canada geese, bald eagles, and trumpeter swans attracted to the year-round warmth provided by Yellowstone's geysers and fumaroles.
$1,002 plus air fare ($258)

Copper Canyon, Mexico
April 7–16, 1990
Ride the world-renowned *Ferrocarril al Pacifico* (railroad to the Pacific) through Mexico's beautiful Copper Canyon and observe the Tarahumara Indians in their celebrations of *Semana Santa,* the holy Easter week.
$1,282 plus airfare ($162)

Jungle Rivers of South America
April 10–25, 1990
On board the *Society Explorer* discover the hidden hearts of the Orinoco and Amazon Rivers, where brightly colored parrots fly and the raucous calls of bickering toucans and howler monkeys echo across the water.
From $4,940 plus airfare

Nomads of Central Asia
April 28–May 17, 1990
View the peoples and cultures introduced in the museum's recent exhibit **Nomads: Masters of the Eurasian Steppe** in the historic towns of Alma-Ata, Chimkent, Turkestan, Tashkent, Samarkand, and Bukhara. Also included are the treasures of the museums of Leningrad and Moscow.
$3,822 plus airfare ($928)

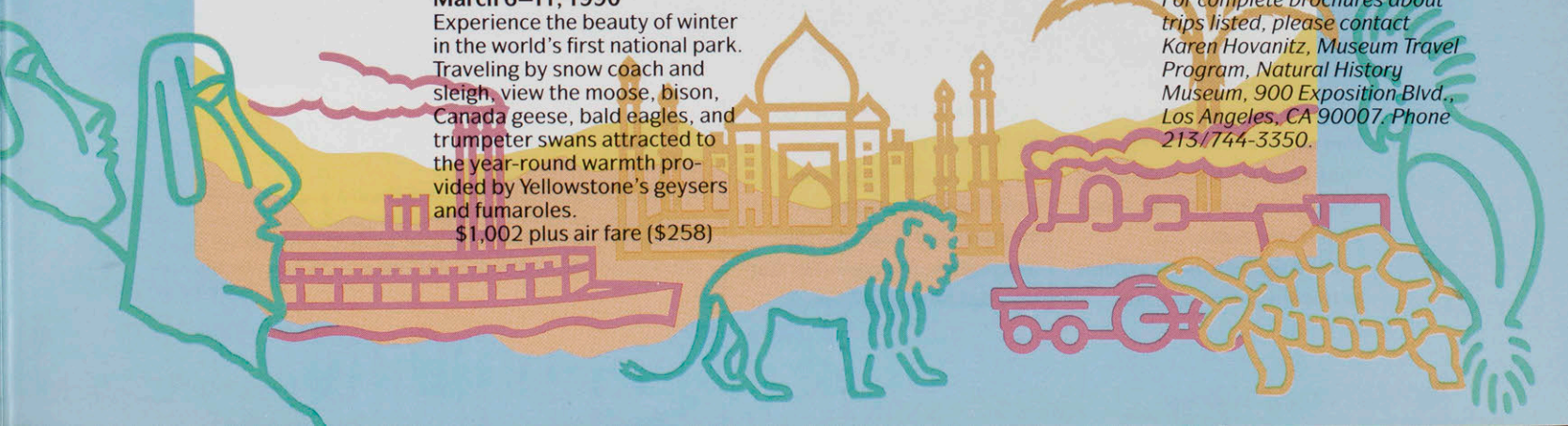
Egypt: The Magnificent Nile
May 18–June 2, 1990
Experience the mystery and romance of the Nile aboard the 44-passenger *Nile Rhapsody.* Visit the most famous sites — Cairo, Giza, Abu Simbel, Aswan, Thebes, Memphis, Luxor and Karnak — as well as the seldom-seen Middle Kingdom.

Australia
July 21–August 11, 1990
The wonders of Australia, including Brisbane, Lone Pine Koala Sanctuary, Lamington Plateau, Darwin, Fogg Dam, Kakadu, Alice Springs, Ayers Rock, Cairns, the Atherton Tablelands, and the Great Barrier Reef.

In the Footsteps of Scott and Shackleton
February 2–March 3, 1991
Retrace the footsteps of early Antarctic explorers in an incredible adventure that will take you to Australia and New Zealand via some of the most remote and unusual islands of the Southern Ocean aboard the *World Discoverer.*

Baja Solar Eclipse
July 9–13, 1991
Journey to the Los Cabos area of Baja to view the total solar eclipse of nearly seven minutes, as well as the natural history of the area.

For complete brochures about trips listed, please contact Karen Hovanitz, Museum Travel Program, Natural History Museum, 900 Exposition Blvd., Los Angeles, CA 90007. Phone 213/744-3350.



Charles L. Hogue

A thermometer cricket.

Do Crickets Really Know How Hot It Is?

Q: I've always heard that it's possible to tell what the temperature is by counting the number of times a cricket chirps. Is this true?

A: According to Curator of Entomology Dr. Charles L. Hogue, it is possible to tell roughly what the temperature is by measuring the chirp rate of "thermometer crickets," two species of tree cricket in the genus *Oecanthus*.

Of course, crickets don't actually chirp the way birds do. Males produce a sound, called *stridulation*, by rubbing a structure called a *scraper* on one front wing against a *file* on the other. Resonating areas on the wings amplify the noise.

Los Angeles County is home to two kinds of tree cricket: *Oecanthus rileyi*, a relatively common species, and *Oecanthus fultoni*, which is more rare. Counting the number of chirps produced by a male *Oecanthus fultoni* in thirteen seconds and adding forty will give you an approximate idea of the temperature in Fahrenheit. *Oecanthus rileyi* chirps almost twice as quickly, so count the chirps in seven seconds or so and add forty. (Common sense will tell you which kind of cricket you hear chirping; if you are coming up with an incongruous reading you are no doubt mistaking *O. rileyi* for *O. fultoni*.)

Of course, by the time you have gone to the trouble of identifying the cricket you could have found a thermometer and measured the temperature directly—but that wouldn't be as much fun.

Los Angeles High School, Summer Class of 1901

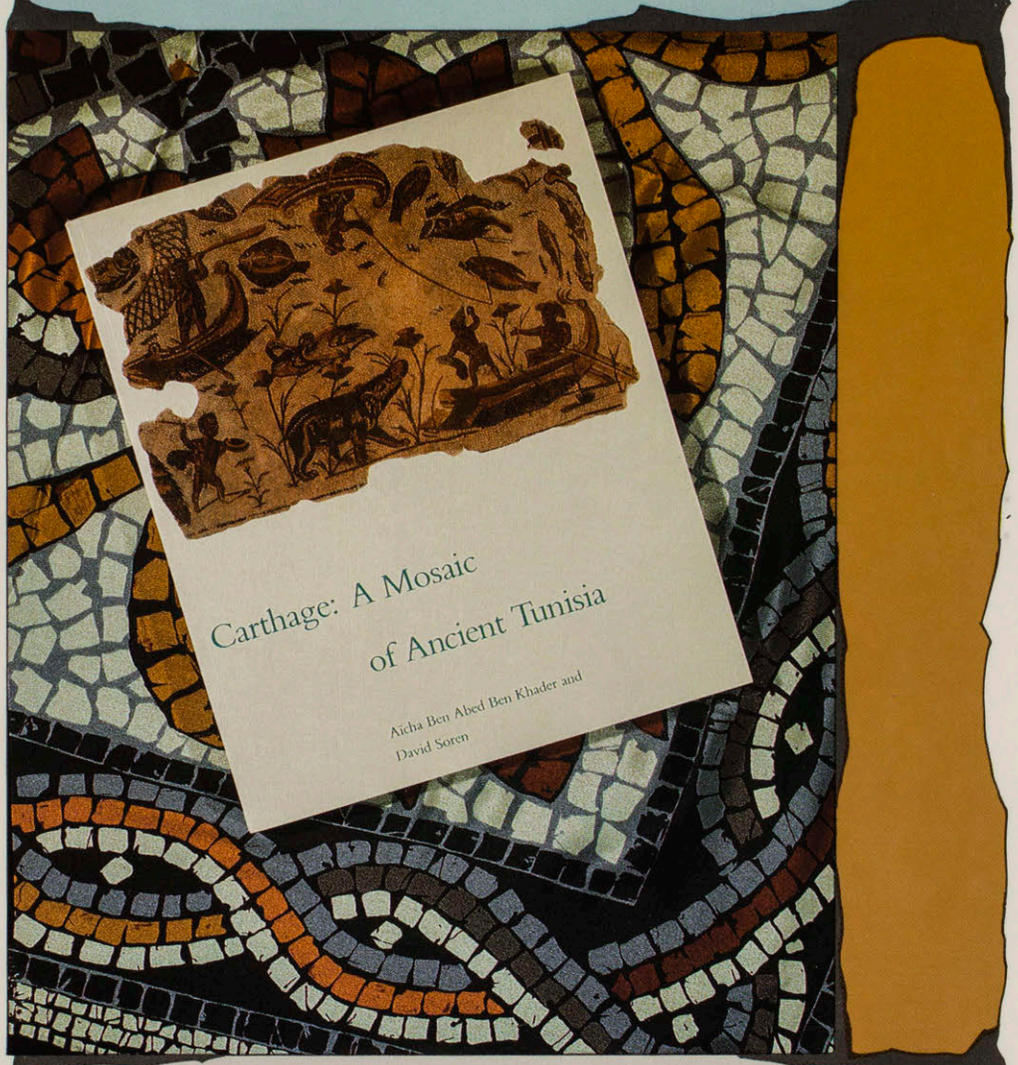
Founded in 1873, Los Angeles High School occupied three rooms in a wooden two-story building. By the time this picture was taken, the school had moved to a red brick building on the top of the hill on Hill Street—a location that not all of the students found charming. One of them wrote in the *Blue and White* (the L.A. High yearbook) that "we must walk five blocks up hill to reach the school, owing to the picturesque site in the ancient graveyard on the hill, remote from the street car lines of the city." Most of the students here are unidentified, but the class officers, gathered around the sign, are, left to right: Lena Southward, secretary; Frank Hutton, president; Rowland Adams, treasurer; Helen Munsey, vice president.

General Photo File #2230

Focus on the West: Images from the Seaver Center *is a* TERRA *feature that presents the photographic highlights of the museum's Seaver Center for Western History Research. The Seaver Center is rich in photographs and other materials relating to the history of the American West.*

CARTHAGE:
A MOSAIC OF ANCIENT TUNISIA

In conjunction with the exhibition **Carthage: A Mosaic of Ancient Tunisia,** the Museum Store offers a beautiful catalog that brings the capital of the Phoenician empire to vivid life. From the seventh century B.C. to the seventh century A.D., Carthage reigned as a great sea power in northern Africa. The catalog illustrates Carthage's contribution to world civilization through full-color and black-and-white photographs of rare Punic jewelry, mosaics from villas, Etruscan bronzes, and other handsome artifacts and artwork. Pictured below is the catalog against a silk crepe scarf inspired by a Carthaginian mosaic. Catalog: softcover, $19.95; hardcover, $35.00; 36″ square scarf, $45.00.



SPECIAL MUSEUM STORE

The exhibition catalog and this elegant scarf—along with a wide selection of textiles, jewelry, and related merchandise—are available in a special Museum Store located at the end of the exhibition.

For more information, or to order your catalog or scarf by telephone, call (213) 744-3434.

Natural History Museum of Los Angeles County
900 Exposition Boulevard, Los Angeles, CA 90007